Agency

Remedial Response

September 1985

EPA

Superfund Record of Decision:

Western Processing, WA
(Second Remedial Action, 09/25/85)

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16. ABSTRACT

The Western Processing site occupies approximately 13 acres in Kent, King County, Washington. Originally, Western Processing was a reprocessor of animal by-products and brewer's yeast. In the 1960s the business expanded to recycle, reclaim, treat and dispose of many industrial wastes, including waste oils, electroplating wastes, waste pickle liquor, battery acids, steel mill flue dust, pesticides, spent solvents, and zinc dross. Some of the Pacific Northwest's largest industries had contracts with Western Processing to handle their wastes. In March 1981, EPA inspected the site and found numerous RCRA violations. Further investigations found extensive contamination of soil, surface water and ground water both on- and offsite. This prompted EPA to issue a CERCLA Section 106 order in April 1983, requiring the owners/operators to cease operations immediately. Current investigations have found approximately 90 of the 126 priority pollutants in the soil or ground water on and off the Western Processing site, or in Mill Creek.

In August 1984, the first remedial action was approved and a group of over 190 PRPs eventually agreed to undertake surface cleanup and stormwater control actions. This second remedial action includes: intensive soil sampling and analysis on- and offsite during the remedial design; selective excavation and offsite disposal of highly contaminated soils, drums and buried wastes in Area I (about 10% of the material in the (see separate sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

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Abstract - continued

top six feet of soil) to reduce the source strength; excavation, or cleaning and plugging all utility and process lines in Area I; following the remedial design, excavation of all soils which exceed the average daily intake level of $1x10^{-5}$ excess cancer risk level; covering/capping all remaining surface soils contaminated with priority pollutants above background levels; maintenance of cover/caps; excavation of utility manholes/vaults near the site; removal or decontamination of the lead-contaminated house in Area 8; construction of a ground water extraction and pre-treatment plant, with operation for a period up to five years; construction, operation and maintenance of a stormwater control system; intensive monitoring of Mill Creek, the east drain, the ground water and the ground water extraction system performance, combined with tests and implementation of system modifications; excavation of contaminated Mill Creek sediments; bench-scale tests of soil solidification techniques, and if system performance should dictate, pilot scale tests of in-situ solidification technologies; performance of supplemental remedial planning studies if shallow ground water contamination beyond the currently contaminated zone or significant regional contamination is detected. Total capital cost for the selected remedial alternative is estimated to be $18,100,000 with O&M costs approximately $2,000,000 to $3,000,000 depending upon the results of pilot scale studies on innovative technologies. The final operable unit for this site may include further ground water and soil remedies plus site closure activities. These remedial actions will be addressed in another ROD following the performance evaluation of the second operable unit.

Record of Decision
Remedial Alternative Selection

SITE

Western Processing Company, Inc.
Kent, Washington

DOCUMENTS REVIEWED

I am basing my decision primarily on the following documents describing the analysis of the cost and effectiveness of the remedial alternatives for the Western Processing site.

- Western Processing Remedial Investigation

- Western Processing Feasibility Study and Executive Summary

- Summary of Remedial Alternative Selection

- Responsiveness Summary

DESCRIPTION OF SELECTED REMEDY

- Intensive soil sampling and analysis on and off the site during detailed design.

- Selective excavation of highly contaminated soils and non-soil materials (drums and buried wastes) in Area I. Off-site disposal of excavated soils and materials. Excavate, or clean and plug all utility and process lines in Area I.

- Using the results of the soil sampling and analysis program, eliminate direct contact threats in the non-Western Processing property through excavation of all soils which exceed the ADI level or the 1×10^{-5} excess cancer risk level, and through covering/capping all remaining surface soils with above background concentrations of priority pollutants. Maintain cover/caps. Excavate utility lines leaving the Western Processing site. Clean utility manholes/vaults near the site. Disposal will in Area I or off-site. Actions will be limited to those off-site soils which may have been contaminanted by Western Processing. The lead-contaminated house in Area 8 will be removed or decontaminated.

- Construct a groundwater extraction and pre-treatment plant

- Operate the groundwater extraction and treatment system for a period of up to five years (Initial phase of system operation.) The purpose of the groundwater extraction and treatment system shall be to prevent furthur contaminant discharges via the groundwater to Mill Creek and the east drain at levels which are harmful to aquatic organisms and to prevent the further spread of, and if possible, remove the contamination from the shallow aquifer.

- Construct, operate, and maintain a stormwater control system

- Intensive monitoring of Mill Creek, the east drain, the groundwater and the groundwater extraction system performance, combined with tests and implementation of system modifications such as acid or solvent-enhanced leaching of metals from the soil.

- Excavate contaminated Mill Creek sediments

- Bench-scale tests of soil solidification techniques and, if system performance should dictate, pilot scale tests of in situ solidification technologies.

- Perform supplemental remedial planning studies if shallow groundwater contamination beyond the currently contaminated zone or significant regional contamination is detected.

DECLARATIONS

Consistent with the Comprehensive Environmental Response Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that the above Description of Selected Remedy at the Western Processing site is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment. The State of Washington has been consulted and agrees with the approved remedy. In addition, this initial phase of system operation/construction will require five years to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of five years.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the off-site transport, treatment, and secure disposal is more cost-effective than other remedial actions, and is necessary to protect public health, welfare or the environment. All off-site disposal shall be in compliance with the policies stated in Jack W. McGraw, Acting Assistant Administrator, Office of Solid Waste and Emergency Response's May 6, 1985 memorandum entitled Procedures for Planning and Implementing Off-site Response Actions.

If additional remedial actions are determined to be necessary, a Record of Decision will be prepared for approval of the future remedial action.

9-25-85
Date

[signature]
Regional Administrator

SUMMARY OF SECOND OPERABLE UNIT REMEDIAL ALTERNATIVE SELECTION AT THE WESTERN PROCESSING COMPANY, INC. SITE, KENT, WASHINGTON

SITE LOCATION AND DESCRIPTION

Western Processing Company, Inc. is located at 7215 South 196th Street in Kent, King County, Washington. The facility covers approximately thirteen acres in Section 1, Township 22 North, Range 4 East (WM). The general area around the site is rapidly developing for commercial and industrial purposes although there is a limited amount of agricultural and residential use in the vicinity. One family lived across the street in a rented house until May 1984. A vicinity map is provided as Figure 1; a site map is provided as Figure 2.

The site is flat and lies in the Green River Valley. Mill Creek, which is also known as King County Drainage Ditch No. 1, abuts a portion of the western boundary of the site. Mill Creek eventually reaches the Green River, which drains to Puget Sound. Surface runoff from the site, if not controlled, would flow into Mill Creek and other adjacent drainage ditches. Small segments of the site adjacent to Mill Creek and other drainage ditches lie within the 100 year flood zone.

The groundwater table under the site averages about six feet below the surface. The native soils are generally of moderate to low permeability. The surficial 40 feet consist of discontinuous lenses of silt, clay and sand, with a hydraulic conductivity of 1 to 10 feet a day. From 40 to approximately 200 feet below the surface, there is fine to medium sand with discontinuous silt lenses and a hydraulic conductivity of 10 to 100 feet/day. A confining layer of at least 200 feet of dense clay and silt exists below 200 feet. At the valley margins a deeper artesian aquifer exists below this unit.

There are no wells in the shallow aquifer currently used for drinking water within a one mile radius of the site. The City of Kent (population 27,000) has drilled wells into the deeper hydraulically isolated artesian aquifer at the valley margin less than a mile from the site to develop an additional drinking water supply for the city. In the past, wells have withdrawn water for domestic use from the shallow aquifer. However, the background water quality from some portions of the shallow aquifer would not meet current drinking water standards, primarily for iron and manganese.

The surface of the site has been cleared of most above surface wastes and contaminated facilities. The site is now graded, and stormwater has been collected and treated on-site by the potentially responsible parties's (PRP's) contractor prior to discharge to the Metro sewer system. Subsurface wastes and contaminanted soils are still in place and include drums of "foundry sand" and other wastes buried by the owner over many years.

SITE HISTORY

From 1953 to 1961, the site was leased from its then current owner and developed and used as a U. S. Army Nike Anti-Aircraft Artillery facility. In 1961, the property was sold to Western Processing Company, Inc, which had been founded by Garmt J. Nieuwenhuis in Seattle in 1957. Western Processing Company is still owned and operated by Mr. Nieuwenhuis.

Originally Western Processing was a reprocessor of animal by-products and brewer's yeast. In the 1960's the business expanded to recycle, reclaim, treat, and dispose of many industrial wastes, including waste oils, electroplating wastes, waste pickle liquor, battery acids, steel mill flue dust, pesticides, spent solvents, and zinc dross. Some of the Pacific Northwest's largest industries had contracts with Western Processing to handle their wastes. Reviews of historical aerial photos disclose great changes in the site's uses and structures every few years as Western Processing's operations changed.

The Kent Fire Department was one of the first agencies to have contact with Western Processing when fires in the early 1970's brought the conditions at the site to their attention. The Washington State Department of Ecology (DOE), and its predecessor agency, the Pollution Control Commission, have monitored and attempted to control wastewater discharges from Western Processing for many years. Discharges were regulated by permit until late 1981. At that time Western Processing had failed to construct wastewater discharge control facilities as required by permit, and, in 1982, elevated metals concentrations were detected in Mill Creek adjacent to the site. In August 1982, the King County Superior Court, acting on a DOE motion, issued an order prohibiting further discharges of zinc contaminated water from Western Processing into Mill Creek. The company was ordered to partially close and to remove zinc-laden wastes from the site at that time. Several other local agencies, including the Puget Sound Air Pollution Control Agency, and the Seattle-King County Health Department have or have had pending regulatory actions or concerns with the company.

EPA inspected the site in March 1981 to determine compliance with the newly-effective regulatory framework of RCRA. Many violations were documented. Although the company notified EPA of its hazardous waste activities pursuant to RCRA Section 3010, an administrative order in May 1981 and substantial negotiations thereafter were necessary to convince the company to submit a Part A application. (The company claimed that as a "recycler" they did not have to comply with RCRA.) EPA issued a second compliance order in June 1982, after another inspection in May 1982 revealed additional significant violations and questionable site management. In February 1983, EPA filed suit in Federal District Court seeking, inter alia, injunctive relief and civil penalties concerning the RCRA violations. This case has since been amended to include CERCLA counts against the owner/operator of the site.

As a follow-up to the earlier DOE and local stream surveys for metals, in May 1982, EPA conducted a stream survey around Western Processing. Twenty-six priority pollutants were found in the surface waters around the site, all of which were subsequently found on-site. In July 1982 the site was added to the National Priorities List.

In August 1982, EPA issued a RCRA 3013 order requiring the site owners/operators to investigate the effects of their past practices on soil, surface water and groundwater. When the owners/operators did not comply (due to alleged financial inability), EPA undertook the investigation and ordered them to reimburse the Agency for its expenses.

The investigation began in September 1982 and concluded in November. In all, 130 soil samples were taken and 35 groundwater samples were obtained. The analyses of these samples confirmed that hazardous substances had been released into the environment, had been leached into and contaminated the shallow aquifer, and had caused widespread contamination of the soils at the site.

When preliminary results of the Fall 1982 investigation became available in early April 1983, EPA issued a CERCLA Section 106 order requiring the owners/operators to cease operations immediately and to provide assurances that they would and could clean up the site. When the assurances were not made, EPA used Superfund money to conduct an immediate removal.

The immediate removal began in late April 1983 and was completed on July 1, 1983. The removal project cost $1.4 million. The purpose of the project was to eliminate the extremely high hazards of the site and to stabilize the site as much as possible to prevent additional degradation of the soil and groundwater. Large quantities (920,000 gallons plus 1,944 cubic yards) of the most hazardous substances on the site were removed. Attempts were made to find users for the materials, but most were sent to approved hazardous waste disposal sites. Many other hazardous substances were stabilized and left on the site.

Once the immediate removal was completed, EPA went back to court to ensure that the owner/operator would not start up operations which could undo the work which had been done. A preliminary injunction was issued which prohibits the owner from receiving or processing materials, gives EPA and its representatives site access, and requires EPA's prior approval for all activities the owner/operator may wish to perform on the site. The judge also specifically found that the site was an imminent and substantial endangerment to the environment.

Stormwater management has been, and will continue to be a major problem until remedial actions are completed. Using State funds, DOE implemented a stormwater initial remedial measure involving excavation of the gypsum sludge pond, restacking and covering the material, and paving a 2 acre portion of the site. A cooperative agreement for a stormwater IRM to handle stormwater control over a larger portion of the site was signed in December 1983, but the project was put on hold when the bids came in much higher than the available budget.

A Focused Feasibility Study for Surface Cleanup was published in May 1984. Through a Phase I Partial Consent Decree, a group of over 190 PRPs eventually agreed to undertake a surface cleanup and stormwater control actions. The surface cleanup was completed by November 30, 1984, except for two trailers of dioxin contaminated material which are still waiting the PRPs provision of permanent disposal. The PRPs have voluntarily continued the stormwater collection and treatment system beyond the April 1, 1985 termination date in the Partial Consent Decree. The PRPs have spent approximately $9 million dollars on the surface cleanup.

Remedial Investigation and Feasibility Study work proceeded simultaneously with these other actions. Phased Remedial Investigation work began during the summer of 1983. Periodic data releases culminated with the release of the Remedial Investigation in December 1984. The Feasibility Study was released in March 1985.

CURRENT SITE STATUS

Approximately 90 of the 126 priority pollutants have been found in the soil or groundwater on and off the Western Processing site, or in Mill Creek. In addition, many tentatively identified compounds have been listed by the laboratories. In the Feasibility Study, sixteen of the priority pollutant compounds were selected as indicators to characterize the contamination on and off the Western Processing property. These indicator compounds include metals and representatives of all classes of organic priority pollutant compounds. Table 1 lists the indicator contaminants.

Table 2 lists the location of the classes of indicator compounds by their location within the soil profile. Analysis by CH2M Hill has shown that over 95% of the contamination at Western Processing is located in the uppermost 15 feet of soil. In the top 6 feet (above the water table), all the contamination is located in the soils. In the saturated zone, the contamination is located in both the groundwater and the soils. Table 3 shows the results of the contaminant distribution analysis for the Western Processing site and two adjacent properties which have been contaminated. The Feasibility Study remedial analysis areas are shown in Figure 2. Areas I and VII are owned by Western Processing Company, Inc..

The groundwater contamination has not migrated significantly from Western Processing. The highest concentrations of contaminated groundwater are directly under the property, as shown in Figures 3 and 4. The groundwater to about 50 or 60 feet below the surface probably discharges into Mill Creek adjacent to the site, or into the East Drain, which is tributary to Mill Creek. For the purposes of the Feasibility Study and NDD, this has been termed the "shallow" groundwater system. EPA's consultants believe that the lateral extent of the groundwater contamination is bounded by these waterways, though during the public comment period, a neighboring property owner's consultants thought that the existing evidence was not conclusive.

The groundwater system is complex. While the regional groundwater flow direction is generally northwest, a groundwater "mound" beneath the site creates radial, and to some extent, downward, flow from the site. A major early concern was that this hydraulic head was driving contaminated groundwater down into the artesian aquifer currently used as a water supply. However, after a major effort during the Remedial Investigation and other studies refined the understanding of this groundwater system, EPA and EPA's consultants now believe the artesian aquifer does not exist below the site and there is no reasonable pathway by which any of this contamination could reach the deep artisian drinking water aquifer at the valley margins. In addition, the current conceptual model of the effective capture depth of Mill Creek is about 50 to 60 feet below the surface.

The adjacent property owner's consultants believes that the 260 ppb of 1,2 trans-dicloroethene detected in Well 35 has migrated down into the regional groundwater system from Western Processing and has crossed under the creek (below the effective capture depth) to his client's property. This may be considered a worst case analysis. Hart Crowser & Associates, an independent EPA contractor, has stated that "The source of this contamination is unknown in that the hydrogeology of the site would tend to make it difficult for this contaminant to migrate to these wells from the Western Processing site." However, to ensure protection of public health and the environment, this worst case possibility is addressed in the Recommended Alternative. In addition, 13 additional wells were drilled in July and August 1985 to the west of the Western Processing site. Information from these wells will also help resolve this question. No known present or currently proposed public or industrial water supply wells could be threatened by this contamination.

Most of the soil contamination is immediately below the site or adjacent to the site. The maximum concentrations of contamination are generally on the Western Processing property (Area I), and within the top 6 to 9 feet. (Table 2). Off-property areas with contamination because of Western Processing activities include Area IX to the north of the site (former surface water drainage across S. 196th Street), Area V to the west between the Western Processing property line and Mill Creek and Areas II and X to the east of the site between Western Processing and the east drains and ditches (former surface and subsurface water drainages.) Area VIII has high surface levels of lead, which may have come from truck traffic making deliveries of battery chips and other metal containing wastes to Western Processing. Figures 5 through 9 illustrate the extent of soil contamination.

The conditions in Mill Creek support the idea that it has received most of the contamination that has left the Western Processing site over the years. The concentrations of metals in the stream water and sediments increase many times as Mill Creek flows by Western Processing. While the surface water discharges from the Western Processing property has ceased, contaminated groundwater is still adding pounds of zinc and other priority pollutants, particularly metals to the creek every day.

Western Processing is not the only source of hazardous substances and degraded environmental conditions in the area. Area VI is the former site of another hazardous waste handling firm, Liquid Waste Disposal. This firm transported hazardous waste liquids. Closure of this site is being handled by the Washington State Department of Ecology under the delegated RCRA program. Also, water quality conditions upstream from Western Processing limit the resource value of Mill Creek with low dissolved oxygen levels. The concentration of phthalates, some PAH's, and some DDT derivatives tends to be higher upstream of Western Processing than through Western Processing. Metal upstream concentrations are also often above ambient water quality criteria for aquatic organisms.

Endangerment Assessment

Two methods were used in the endangerment assessment to determine the public health risk presented by the contaminants at Western Processing. One method was used to address the risks associated with contaminants known or suspected to be carcinogens; the other method was used to address risks associated with non-carcinogens. The endangerment assessment considered all priority pollutants for which there were either cancer potencies or Acceptable Daily Intakes (ADIs). For carcinogens, excess lifetime cancer risks were calculated by using a procedure that estimates the increased probability of developing cancer for someone who ingests the soils or water from Western Processing site over a long period. For non-carcinogens, there are a few legally enforceable standards (such as federal or state drinking water standards), as well as other criteria such as published guidelines that calculate the amount of a particular chemical that can be ingested without harm.

Assuming that a person works on the site for 40 years, ingestion of the on-site soils up to 12 feet deep (assuming the maximum concentrations found on site) would lead to a maximum excess lifetime cancer risk of 2×10^{-4}, principally from PCB contamination. There is a potential excess lifetime cancer risk of 5×10^{-7} associated with the ingestion of onsite surface soils with site mean concentrations in a future worker scenario. An estimated potential cancer risk of 5×10^{-6} is associated with the ingestion of soils if the maximum surface concentrations are used. Excess lifetime cancer risks in three potential future residential scenarios ranged from about 0.8 times to 50 times greater than the worker scenarios.

Soils in six off-property areas (II, III, V, VI, and IX and Mill Creek sediments) also had detected PCB's, though only in surface soils. Areas VI and IX had at least three reported detections in the surface soils, and thus an excess cancer risk could be calculated. With the mean and maximum concentrations and the worker scenario, the potential excess lifetime cancer risks associated with ingestion of soils are 9×10^{-6} and 4×10^{-5}, respectively, in Areas VI and 3×10^{-5} and 5×10^{-5}, respectively, in Area IX. Again, excess lifetime cancer risks in three residential scenarios would be 0.8 to 50 times greater. However, residential development in this area is very unlikely.

No known domestic or industrial water supplies are currently affected by the site. Use of onsite groundwater as a potable water source for a work place, however, would present an estimated excess lifetime cancer risk of 0.2 using maximum onsite concentrations and 0.008 using mean onsite concentrations. Cancer risk would increase to an estimated 0.5 if a residential scenario is used with maximum concentrations and 0.02 if mean onsite concentrations are used. Organic compounds contribute most of this excess lifetime cancer risk.

A number of ADIs are also exceeded with an assumed consumption of 0.1 gram of soil per day or 2 liters of groundwater per day. These include lead, chromium, cadmium, toluene, 1,1,1-Tricholoethane, phenol, mercury, and Bis (2-ethylhexyl)phthalate.

While organic priority pollutant contamination in Mill Creek does not appear to pose a threat to human health based on recreational use, the water in Mill Creek near and downstream of Western Processing is likely to be toxic to a wide variety of aquatic organisms. While Mill Creek may have once supported salmon runs and trout, only three-spine sticklebacks have been found in Mill Creek between downtown and Springbrook Creek in recent years. (Coho salmon and cutthroat trout have been found upstream of downtown.) Concentrations of several dissolved metals, such as zinc, cadmium, copper, and possibly chromium, exceed the ambient water quality criteria concentrations for the protection of freshwater aquatic organisms by several orders of magnitude at the Western Processing site, probably as a result of groundwater flow into Mill Creek from Western Processing. Sediments in Mill Creek are also contaminated with priority pollutant metals. The concentrations of organic contaminants in Mill Creek do not exceed the ambient water quality criteria for the protection of freshwater aquatic organisms.

These releases will continue unless remedial action is taken.

ENFORCEMENT

Of the approximately 300 generator and transporter PRPs at the Western Processing site, over 190 PRPs signed the Phase I Partial Consent Decree and contributed money towards the surface clean-up work. The Western Processing Coordinating Committee, representing a large but unknown number of PRP's, submitted a subsurface clean-up proposal to the government in October 1984. This proposal was presented to the public (and identified as the PRPs proposal) as Example Alternative 4 in the Feasibility Study. Also, the PRPs had their contractor continue to gather data for detailed design and bid specs for the subsurface clean-up. The Coordinating Committee has also voluntarily continued the stormwater control actions beyond the period agreed to in the Partial Consent Decree.

Negotiations for the Phase II remedial action began in late May 1985 and concluded unsuccessfully in August-September 1985 when the PRPs and the goverments (EPA and WDOE) failed to agree on a remedy.

The use of the Fund is recommended to ensure a proper remedial action which will protect the public health and welfare and the environment. Also, it is recommended that the filed Western Processing case in federal court be amended to include recovery of the Goverments' costs.

10
ALTERNATIVES EVALUATION

After completion of the remedial investigation, the types of problems existing at Western Processing were categorized as follows:

- Potential direct human and animal contact with contaminants from Western Processing.

- Past and potential future contaminated surface water runoff

- Infiltration and subsequent leaching of contaminants from the unsaturated zone into the groundwater.

- Contaminated groundwater beneath the site

- Contamination of Mill Creek via groundwater migrating from the site to levels that exceed background or ambient water quality criteria for aquatic organisms.

Given the nature and extent of contamination on and off the Western Processing property and the environmental and human health risks that the contamination poses, a comprehensive list of possible remedial action technologies that could be used to remedy the contamination was developed. An initial screening was conducted to identify the technologies that are proven and most applicable to and feasible for the problems at Western Processing. The list of suitable technologies was then used to develop a set of remedial action components that were determined to be particularly suitable for these problems. None of the remedial action components is capable by itself of addressing all the problems at Western Processing. Therefore the components were combined into comprehensive remedial actions for the detailed analysis of alternatives.

The Feasibility Study contains seven example alternatives which were developed to mitigate the problems identified in the nature and extent of contamination and the endangerment assessments. The example alternatives include a No Action alternative, totally on-site disposal, totally off-site disposal, and an alternative which has been developed and proposed by the PRPs. The PRP's alternative was developed separately from the government and they used different goals in developing their alternative. While all seven are feasible alternatives, they are called example alternatives because there are an infinitely large number of alternatives, particularly when the possible areal extent of a particular component is considered. Alternative 4 has only source control measures, Alternative 7 has only offsite measures, and Alternatives 2, 3, and 5, while generally source control measures, do include some offsite measures as well.

The example remedial action alternatives were evaluated and compared to determine their relative cost, and their technical feasibility, public health, and environmental aspects. Table 4 summarizes the seven alternatives and the evaluations. The numbered areas refer to the numbered parcels in Figure 2.

The nature and extent of contamination on and off Western Processing is a function of the type of materials which were released on the site and the pathways by which those materials were able to move. Each contaminant's mobility or ability or lack of ability to dissolve into, and move with, water, greatly affects the extent of contamination of that chemical. Mobility also affects the relative success a particular example alternative has in removing that contaminant. As the summary chart shows, any of these alternatives will work if it is operated for long periods of time. Such an extended period may not be technically or administratively practical.

The two-volume Feasibility Study and Executive Summary contains more information on the screening criteria and the steps used to develop the alternatives.

One of the findings of the Feasibility Study was that complete excavation and off-site disposal of contaminated soils would be prohibitively costly. Also, removal of metals from these soils with the proposed groundwater extraction and treatment system is likely to be a very long term operation. Therefore EPA has reconsidered the potential for in situ soil treatment technologies.

In situ enhanced leaching would involve lowering the pH and/or adding other chemicals to the leaching solutions applied either at the site surface or in the very shallow unsaturated zone. (The acid leaching would be followed by a neutralization step.) Enhanced leaching allows the contaminants, particularly the normally very hard to remove metals, to be removed much faster. The preliminary results of soil column tests done by the PRPs on Western Processing soils have shown that the available zinc can be reduced about 10 times faster when leached with pH 3.6 water. Additional capitol costs to implement this technique once the groundwater extraction system is operating are estimated to be $600,000, assuming that adequate solution can be applied through an infiltration trench.

Through soil washing, chelating agents, such as EDTA, can also remove the metal contaminants from the soil. Because of the high cost of the chemical and potential environmental effects, these chelating agents would not be used for in situ leaching. Rather, use of these agents would require digging up the soil, washing the soil in a special on-site unit, and then replacing the soil. Preliminary results of soil column tests performed for EPA on Western Processing soils have shown heavy metal removals of from 15% for nickel to essentially 100% for lead and cadmium.

In-situ stablization is another innovative technique. This uses stabilization chemicals thoroughly mixed with the contaminated soils to tie the contaminants in place, immobilize soil particles, decrease the permeability of the soil mass in relation to surrounding soils, and occasionally, to transform certain chemicals into less toxic forms. Metals are particularly amenable to this technique. Among the advantages of this technique are that an extremely hard and stable layer is formed which can serve as a foundation for other structures, such as a cap or a road. Laboratory scale tests are currently underway using Western Processing soil. The estimated cost of this technique is $35 per cubic yard within 15 feet of the surface, or $9,000,000 for the 11 acre site, 15 feet deep. Long term operational and maintenance expenses are estimated to be minimal at a properly stabilized site, involving only periodic performance monitoring.

If either soil stabilization or soil washing technology is chosen in the future, the ROD will be amended after an oportunity for public comment.

COMMUNITY RELATIONS

A community relations program has been in place for two years. DOE and EPA have taken an active role in this plan. The major elements have included: monthly interagency meetings with the Kent City Mayor and her staff; public presentations/meetings whenever the city or city council has requested it; press releases at all major events, such as the release of data or reports, or the start of particular on-site activities; wide distribution of press releases and fact sheets; and the availability of government staff by phone to respond to questions from the public. Public interest is sporadically high, though the City of Kent, certain neighboring property owners, and a few individuals have had a high level of continued interest.

In mid-March 1985, a letter, a fact sheet, a separate Executive Summary, and the two volume Feasibility Study was made available to the public. Over 500 letters, fact sheets, and Executive Summaries were sent out. (This includes the approximately 300 copies which were sent to the PRPs.) Over 100 copies of the entire Feasibility Study were sent out to individuals, PRPs, and agencies known to be interested in the site. A dozen copies were made available through the local public and EPA regional libraries. In addition, copies were available free from EPA for the asking. The 30 day comment period closed April 10, 1985. As of April 26, 1985, 19 comment letters had been received. No letters were identifiable as being from any PRP or the PRP committee.

A series of four public meetings/workshops were held at the Kent City Hall. By the second meeting, virtually all attendees were what could be called "extremely or financially interested parties." Presentations were made by the PRP's coordinating committee's consultants, a neighboring property owner's consultants, the owner/operator of Western Processing, the most active environmentalist, and the fisheries biologist of the local Indian tribe, as well as by CH2M Hill. The on-going lawsuit between the neighboring property owner and the PRPs limited, to some extent, the range of potential exchanges between those two parties. Special small briefings were held for the affected property owners, natural resource agencies, environmentalists, and the press.

The major issues that were raised were:

- Adequacy of the data. Statements were made that there isn't enough data to answer all the questions or to decide on a remedial action. The major areas which were affected by this concern are groundwater (Is there deep groundwater contamination which has reached the regional flow system?); Mill Creek (How far downstream and how deep are the sediments contaminated?); and, to a much smaller extent, soil (There isn't enough information to determine the exact extent (vertical and horizontal) of contamination so that excavation or capping can be defined.) During the comment period, most interested parties agreed that at least some components of a remedial action, especially on-property excavation with off-site disposal, could and should begin while any missing data are collected.

- Future public participation. Any further information which is collected needs to be shared with the public and further public input requested before major decisions are made.

- Property values. The neighboring property owners are greatly concerned about being able to profitably develop and sell their land.

A major, though not always successful, goal of the public comment period and meetings was to encourage participants to come up with and to give to EPA constructive ideas as to how the site should be cleaned up, rather than to focus on the problems they perceived in the Feasibility Study. Alternatives which involved excavation and off-site disposal appeared to be favored, while almost no one gave serious consideration to Alternative 3, the on-property landfill. Improvement of the groundwater was also favored. However, only very general feedback was given to EPA on what levels of "clean" were considered important. It appears that clean was generally assumed to mean background (e.g. upstream) water quality in Mill Creek, and adequately low soil contamination to allow City and the Health Department approval of industrial developments. One individual suggested that extremely stringent soil contamination levels were necessary along the underground utility corridors where maintenance workers may need access. Capping and then developing the entire area was suggested by some others.

Mill Creek appears to be a potentially complex issue. A number of people suggested that rerouting Mill Creek could be a good solution to the Western Processing situation. A number of the property owners are extremely interested in having Mill Creek rerouted so that the existing creek bed could be filled and their property more easily and fully developed. Some of the suggestions for moving Mill Creek could make the extent of shallow groundwater contamination greater and thus would be detrimental. These alternatives would be environmentally acceptable only if the existing creek bed would be replaced by a French drain, and if the French drain was properly maintained. The natural resource agencies and the Indian tribe are most concerned that Mill Creek water quality and fish habitat are improved.

RECOMMENDED ALTERNATIVE

The objectives of any remedial action at the Western Processing site are to: (1) prevent direct human contact with or ingestion of contaminated soils either on or off-site; (2) prevent the further spread of and, if possible, remove the contamination from the shallow aquifer; (3) prevent further contaminant discharges (via groundwater) to Mill Creek at levels which are harmful to aquatic organisms; and (4) control contaminated storm water runoff from the site. The example alternative presented in the Feasibility Study which includes deep excavation with short-term pumping and treating of groundwater appears to come closest to meeting all of the objectives, but its cost is prohibitively high. On the other hand, the results of the groundwater model used during the Feasibility Study indicate that the shallow excavation option (with metals laden soils left in the satuated zone) may permit metals to discharge from the groundwater to Mill Creek at concentrations harmful to aquatic life for many years after the pump and treatment system is turned off and the present hydraulic gradients are reestablished. Therefore, some intermediate alternative such as partial excavation with some pumping/treatment of groundwater, followed by in situ stablization of the metals in the soil might ultimately prove to be the most cost-effective remedy. However, the cost and technical feasibility of in situ soil stabilization (or other innovative technologies) has not yet been evaluated and thus cannot be a part of this present remedial action.

Therefore, the proposed remedial action is an interim approach. The following components are proposed for the present operable unit:

- Intensive soil sampling and analysis on and off the site during detailed design.

- Selective excavation of highly contaminated soils and non-soil materials (drums and buried wastes) in Area I to reduce the source strengh. Off-site disposal of excavated soils and materials. Excavate, or clean and plug all utility and process lines in Area I.

- Using the results of the soil sampling and analysis program, eliminate direct contact threats in the non-Western Processing property through excavation of all soils which exceed the ADI level or the 1×10^{-5} excess cancer risk level, and through covering/capping all remaining surface soils with above background concentrations of priority pollutants. Maintain cover/caps. Excavate utility lines leaving the Western Processing site. Clean utility manholes/vaults near the site. Disposal will in Area I or off-site. Actions will be limited to those off-site soils which may have been contaminanted by Western Processing. The lead-contaminated house in Area 8 will be removed or decontaminated.

- Construct a groundwater extraction and pre-treatment plant

- Operate the groundwater extraction and treatment system for a period of up to five years (Initial phase of system operation.) The purpose of the groundwater extraction and treatment system shall be to prevent further contaminant discharges via the groundwater to Mill Creek at levels which are harmful to aquatic organisms and to prevent the further spread of, and if possible, remove the contamination from, the shallow aquifer.

- Construct, operate, and maintain a stormwater control system

- Intensive monitoring of Mill Creek, the groundwater and the groundwater extraction system performance, combined with tests and implementation of relatively inexpensive system modifications such as acid or solvent-enhanced leaching of metals from the soil.

- Excavate contaminated Mill Creek sediments.

- Bench-scale tests of soil solidification techniques and, if system performance should dictate, pilot scale tests of in situ solidification technologies.

- Perform supplemental remedial planning studies if shallow groundwater contamination beyond the currently contaminated zone or significant regional contamination is detected.

The final operable unit should occur after the initial phase of system operation and might include:

- Continued groundwater extraction.

- In situ solidification of contaminated soils.

- Site close-out with a cap and provisions for long-term monitoring.

- Long-term institutional controls and deed restrictions.

- Alternative concentration limits for groundwater.

Determination of the final operable unit components will be made in another ROD pending evaluation of the performance of the second operable unit.

Each component is discussed individually below. The discussions include the recommended alternative and the costs. The cost-effective remedy is one which effectively mitigates and minimizes threats to and provides adequate protection of public health, welfare and the environment, considering cost, technology, reliability, administrative and other concerns. Adequate protection is considered to be, at a minimum, a remedy which attains or exceeds applicable or relevant Federal public health or environmental standards. Primary consideration has been given to these standards in the selection of the recommended alternative. The recommended alternative combines elements from the different example remedial alternatives examined in the feasibility study, as well as other elements brought to EPA's attention during and after the public comment period.

On-site (Area I) Soils

The recommended alternative for Area I consists of: a non-destructive geophysical subsurface survey of Area I to locate drums, tanks, and buried utilities, to be followed by probing and sampling as necessary of discovered items; excavation of abandoned utilities, concentrated non-soil or containerized wastes, and areas of known PCB concentrations over 50 ppm; excavation, or pumping out, cleaning, and plugging of buried tanks and facilities if they cannot be excavated; and a deed or title restriction on the use of the site. Testing and sampling to define the excavation would be done during the remedial design, while the type and design of the cap would be determined during the next phase of remedial action. The estimated costs for this alternative are: $625,000 for the sampling and analysis during detailed design; $5,200,000 for the excavation and other on-site work during this phase of the remedial action. This cost estimate is based on excavating and disposing off-site 10,650 cubic yards, or 10% of the material in the top six feet. The cost for the excavation and disposal phase is only an estimate and cannot be accurately determined until the sampling is completed. These activities will reduce the source strength.

The alternatives considered in the Feasibility Study included leaving wastes in-place and placing a multilayer RCRA cap over the site, placing all the material in the unsaturated zone in the double-lined landfill on the site, and excavating to background with transport and disposal off-site. Significant contamination is found down to 15 feet. Cleaning to background would cost more than $164,000,000 (Alternative 5 present worth, based on disposal costs in Spring 1985). The selected alternative is similar to Alternative 2, but is more protective. (Alternative 2 placed a RCRA cap over the site, and excavated only buried containers and utilities.) In addition to the protections provided by Alternative 2, the recommended alternative would remove from the site the most hazardous materials and the materials most likely to make it hard to achieve the groundwater improvements or cap stability. It differs from Alternative 2 by excavating some of the waste materials on the site, allowing some of the currently off-site soil contaminated by Western to be brought back on to the site and placed under the cap, and postponing placement of the cap until the groundwater extraction program is completed. It is not known whether the cap would be compatible with the extension of 72nd Avenue S. or other development under consideration by the city of Kent.

Off-site soils

The recommended alternative for off-site soils consists of: extensive additional soil sampling and analysis; excavation of abandoned utilities leaving Area I; excavation of soils contaminated with PCBs over 2 ppm; excavation of hot spots (defined below); covering/capping soils above background; inspection and cleaning of "live" utility line vaults/manholes which may have been affected by Western Processing; and the removal or decontamination of a lead contaminated house. Additional excavation of soils with zinc or cadmium or other heavy metal concentrations which may affect achieving the Mill Creek and shallow groundwater goals may also be necessary.

The estimated costs for the recommended alternative are: $1,000,000 for the sampling and analysis during detailed design; and $625,000 for the excavation, capping/covering and other off-site work. The cost for the excavation and disposal phase is only an estimate and cannot be determined until the sampling is completed and decisions are made on what material can be consolidated on Area I. This estimate assumes that almost all of the excavated off-site soils will be placed on Area I. (See Selection of Disposal Facility section.)

The additional soil sampling and analysis would be done during remedial design. All off-site remedial analysis areas would be sampled except for Area VI. The sampling program would be phased, with the initial phase consisting of over 300 sampling locations. The tightest grids and deepest samples would be in the areas of former overland flow in Areas II, V, and IX. Table 5 contains more details on the initial phase of the soil sampling program.

Soils contaminanted from Western Processing activities with above background priority pollutants will also be covered with materials of permeability less than or equal to the natural subsoils, unless it is more cost-effective or practicable to excavate these soils. Excavation of soils with below hot spot concentrations will be likely in the S. 196th Street ditch and other drainage ditches, as placing a cover/cap may not be practicable. Off-site areas with small areas of above background concentrations may be cost-effective to excavate. The decision on whether the cover/cap should be soil or other materials (such as asphalt or concrete) will be mostly dependent on what alternative will have the lowest maintenance requirement for a particular property. Discussions with the property owners will also be a part of this decision. Detailed design work may disclose that, for certain off-site areas (e.g. Area II), it is more cost-effective to cap the area, even if certain utilities must be moved.

The exposure assessment/risk analysis approach has been used to set the action levels for defining hot spots, or the residual contamination which may be left in place as it will not pose a threat to health or the environment through any route of exposure. The impacts of the off-site soils on the groundwater are addressed through the shallow groundwater component. For direct contact, a hot spot has been defined to be soil with any one compound exceeding the ADI, or with a cumulative cancer risk in excess of 1×10^{-5}, or PCB concentration above 2 ppm. These cancer risks are extremely conservative, as they are based on a 40 year exposure, while the maximum likely exposure to the non-surface soils would be short-term while placing utilities or foundations on these properties for light industrial developments. The cover/cap will provide additional protection against release to the groundwater, surface water, or to the public (through inhalation.)

Alternatives considered in the Feasibility Study for off-property areas for remedying direct contact were no action, multilayer RCRA capping, and one foot or three feet of excavation and fill. Other alternatives raised during or after the comment period include total excavation to the water table, hot spot excavation in the top 4 feet, excavation to background, and deed or title restrictions.

The other alternatives for off-property areas are not as protective of public health or are not cost-effective, or have institutional problems. For those soils above background, no action and a uniform one foot excavation are not as protective of public health. A uniform 3 foot excavation would be more costly than the recommended alternative while providing fewer public health benefits because there would be less depth of hot spots removed. The property owners do not want a multilayer RCRA cap on their properties which may disrupt their development plans for their properties. As a reflection of community desires, the City of Kent also strongly supports measures that will allow these properties to be developed.

Selection of Disposal Facility

The proposed alternative involves both on-site and off-site disposal. To minimize unnecessary utilization of limited double-lined landfill capacity, and to reduce costs associated with this remedial action, contaminated soils which are currently off-site and which are not WDOE extremely hazardous wastes and which do not contain PCBs may be brought on to Area I for placement under the eventual cap, and/or to be handled as part of any in-situ treatment or stabilization. This consolidation of wastes from releases from Western Processing is considered to be fully compliant with the applicable and relevent provisions of RCRA. The soils which will be brought onto Area I will generally be less contaminated than the current Area I site average soil contamination, and will be a much smaller volume than the total amount of on-site contaminated soils and wastes, but may be a larger volume than the soils and wastes which will be excavated and taken to off-site disposal from Area I. The placement of off-site soils would be scheduled to occur after completion of the on-site excavation. A clean surface (e.g. gravel) would be placed on top of all soil to provide a clean work surface for the groundwater extraction system. Careful design will be needed to ensure that the contaminated soil will not add sufficient depth to interfere with the operation of the well point system.

Off-site transport and disposal of some of the hazardous substances are is necessary to protect public health, welfare and the environment from a present or potential risk and to improve the reliability of the proposed remedial actions. Excavation and removal to an off-site disposal facility would include transportation in accordance with DOT regulations, disposal in a government approved facility, and replacement with clean fill if the excavation is not in Area I. Selection of a disposal facility will be in accordance with the guidelines in the Acting Assistant Administrator, Office of Solid Waste and Emergency Response, Jack W. McGraw's May 6, 1985 memorandum Procedures for Planning and Implementing Off-site Response Actions. This policy requires that, among other items, all off-site disposal of hazardous waste must use disposal facilities and units which have at least two liners and a leachate detection, collection and removal system above and between the liners. In addition, the facility must have no significant RCRA violations (as determined by EPA), unless the owner or operator of the facility has committed through an enforceable agreement with the government to correct the problem. The sites must be inspected within six months of disposal of the CERCLA waste.

Shallow Groundwater

The recommended alternative for the shallow groundwater component is a groundwater extraction system in Areas I, II, V, and IX, unless design studies demonstrate that a smaller array will be sufficient to establish an inward hydraulic gradient throughout the currently contaminated shallow groundwater zone. The recommended alternative includes low capital cost in situ chemical leaching techniques after monitoring the site to ensure that adequate gradient control has been established and after sufficient laboratory scale testing. Institutional controls to permanently prevent the extraction and beneficial use of the zone of contaminated groundwater will also be necessary prior to site close-out.

The objectives for the shallow groundwater component are: (1) no degradation of the shallow groundwater beyond the currently contaminated zone, and (2) a reduction in groundwater contamination concentration to levels that will protect the aquatic organisms in Mill Creek. (See the Mill Creek component section.) These objectives will be achieved at least partly by a well-point groundwater extraction system, with treatment and discharge of the extracted water to Metro. The clean-up of Western Processing will not be considered to be complete until these objectives are achieved and continue to be achieved after termination of the groundwater extraction system operations.

The alternatives considered in the Feasibility Study included no action, pump for five years, pump for 30 years, pump for 120 years, and excavate 300,000 cubic yards of soil while pumping for four years. Because of the unknowns in predicting groundwater and contaminant behavior in this system, as demonstrated in the analysis in the Feasibility Study, only a phased remedy for the shallow groundwater component can be addressed at this time.

As described in the Alternatives Considered section, a number of innovative technologies were brought to EPA's attention after the Feasibility Study was completed. The preliminary testing column testing for enhanced leaching of Western Processing soils indicates that metals removal can be accelerated several times. Leaching solutions applied to the site would be collected by the well point system. However while these techniques may work in theory or in lab scale tests, these leaching techniques may have real life practical or cost-effective limits in the field. Pilot scale tests may be necessary. Other techniques such as in-situ stabilization may become more feasible over the next few years and may make it possible to achieve the shallow groundwater objective by immobilizing the metals rather than removing them.

The initial capitol cost of the selected alternative is estimated to be $6,800,000 if the treatment plant is designed to handle enhanced leaching. The annual O&M expenses are estimated to be $1,500,000 to $2,500,000 (in constant 1985 dollars) for the first 15 years. Fifteen years is the estimated lifespan for the major equipment items. The O&M expenses are dependent on whether the enhanced leaching system is operating. If detailed design studies disclose that the costs associated with enhanced leaching are significantly above these estimates, a decision on enhanced leaching will be postponed to the next phase of remedial action.

The first performance standard - no further degradation of the shallow groundwater - will be achieved by placing monitoring wells and checking their water levels and quality. The shallow groundwater flow pattern is largely controlled by the presence of Mill Creek and the East Drain.

The second performance standard - water quality protective of aquatic organisms in Mill Creek - is expected to be achievable relatively quickly on a temporary basis when the groundwater extraction and treatment system changes hydraulic gradients and stops the groundwater discharge to Mill Creek. Achieving the standard on a permanent basis (e.g. without the operation of the groundwater extraction and treatment system) will require a reduction in the site groundwater concentration of the inorganics with the largest loading to Mill Creek from the Western Processing site, namely zinc, cadmium, and possibly chromium. Based on a mass balance/dilution analysis, CH2M Hill has determined that the groundwater target levels to meet creek water quality criteria are zinc at 500 ppb and cadmium at 10 ppb. To achieve these groundwater target levels, over 99 percent of the available (mobile) zinc and cadmium would have to be removed from the site. Assuming all of the zinc and cadmium measured at the site is available, over 120 years of groundwater pumping would be required to achieve the required levels.

Originally, another objective of the shallow groundwater component was to improve the shallow groundwater at the boundary of Area I to drinking water standards. However, this standard is may not achievable for technological reasons. While organic contaminants can be mostly eliminated from the shallow groundwater system (or reduced below drinking water standards or criteria) in 5 to 30 years of pumping, some of the inorganics found below the site could not be reduced to drinking water standards in over 120 years of pumping, though the technologies which may be necessary to produce groundwater quality which will protect Mill Creek will also greatly reduce the concentrations of those inorganics for which there are drinking water standards.

If groundwater cannot be returned to MCLs or other health based criteria (e.g. acceptable excess cancer risk levels or ADIs), ACLs may be established in a future ROD. The ACLs may utilize institutional controls. Institutional controls on both the state and local level may be proposed to ensure that there will be no threats to public health from this contaminated groundwater. WDOE may be able to restrict groundwater extracted at rates over 5000 gpm, but has no control over domestic sized withdrawals. However, the industrial zoning of the area, alternate water supplies, and city controls should preclude the smaller sized withdrawals.

Forces other than institutional controls are more likely to ensure that no one withdraws this water for use. The shallow groundwater under the site, as discussed in the Section on Consistency with Other Environmental Laws, is not an important groundwater source in the Kent area because of generally low yield (less than 100 gpm) and poor water quality. Large amounts of excellent quality water are available from the City of Kent production and distribution system. The agency's original concerns for the threats to the City of Kent water supply wells have turned out to be unfounded, as the artesian aquifer only exists at the margins of the valley, not below Western Processing.

Mill Creek

The objective for remedial action in Mill Creek is to eliminate those water quality conditions in Mill Creek which limit aquatic organisms of concern and which are caused by Western Processing. This objective will be met by groundwater control, shallow groundwater quality improvement, and sediment excavation.

The performance standard is to return Mill Creek waters and sediments to ambient water quality criteria for aquatic organisms or to upstream (creek or groundwater) background, whichever is less stringent. However Mill Creek has a number of unusual conditions which would exist even if Western Processing were not present. These include background (upstream) concentrations of certain metals and organics above water quality criteria for aquatic organisms and background groundwater concentrations which are also above water quality criteria. The upstream concentrations above criteria are probably from both other sources of pollutants and the high natural groundwater concentrations of metals.

The lack of valuable aquatic organisms in Mill Creek is probably more from the many sources of pollutants and habitat modifications in Mill Creek, than from the high background groundwater concentrations. The aquatic water quality criteria are based on the most sensitive species. A review of the criteria development documents show that the fish of most concern in Mill Creek - namely salmonids and trout - can live in zinc concentrations much higher than the Federal water quality criteria. Similar information is available on cadmium.

The east drain water and sediment quality will also be improved with a combination of groundwater control, shallow groundwater quality improvement, and sediment excavation.

In addition, the recommended alternative includes a sediment excavation program to remove sediments contaminated with metals in a bioavailable form because of the potential threats to bottom-dwelling or bottom-feeding organisms. This removal would be planned for after the groundwater control system has been effective in stopping groundwater discharge from Western Processing to the creek. At a minimum, the stream length to be excavated would extend from the upstream end of Area 5 to downstream of the railroad drainage ditch discharge. Additional downstream areas of known deposition would be tested for bioavailable metals which came from Western Processing.

Other alternatives for Mill Creek presented in the Feasibility Study were no action and groundwater control to achieve the water quality criteria but no sediment excavation. The groundwater control only alternative would be protective of the environment, but would take longer to remedy the problem. The groundwater control only alternative would allow natural sediment transport to clean out the sediments over a number of years. The recommended alternative is more quickly protective of the environment and is thus a cost-effective alternative.

Storm water controls

Storm water must be managed both on and off the Western Processing site, as well as during and after construction. The PRPs have been collecting and treating Area I stormwater prior to discharge to the Metro system. If necessary, a similar system will be continued by EPA and WDOE until construction begins. During construction on and off the Western Processing property, all stormwater must be handled according to good construction practices. This may include collecting and treating the water prior to discharge. After Area I is capped, clean stormwater will run off the site, with the rate and quantities consistent with the City of Kent's stormwater ordinances. The off-property covered/capped areas will require maintenance to ensure that erosion and sedimentation will not occur.

Besides no action, there are three other alternatives for handling Area I stormwater during the groundwater pumping period. (The final RCRA cap would be placed on the site after pumping is completed.) These are: 1) continued collection, treatment, and discharge to Metro of the stormwater; 2) a temporary cover/cap on the site which would allow the water running off the property to be uncontaminated; and 3) store the stormwater on the site and allow it to infiltrate through the unsaturated zone. The no action alternative is not protective of public health or the environment. Collection, treatment, and discharge of the stormwater would have the highest O&M of any of these alternatives, and would use up a large percentage of the potential sewer line capacity which will be needed for discharge of the treated groundwater. Of the other two alternatives, the infiltration of the rainwater is the recommended alternative because it will enhance the leaching of the metals and lower the operating costs for the acid leaching system.

The capitol cost of the recommended alternative is included in the grading to install the groundwater pumping system.

Monitoring

The recommended alternative includes an extensive monitoring program designed to monitor the effectiveness of the remedial action, to provide information for future phases of the remedial action, and to investigate the deeper regional (50 to 150' deep) groundwater conditions.

This monitoring program will include:

- Nine to twelve well clusters encircling the contaminanted groundwater zone, with 6 to 8 shallow wells screened at 10 to 30 feet within the contaminated zone. The well clusters will included wells screened at 10 to 30 feet; 40 to 60 feet; and 80 to 100 feet below the surface. At least three clusters will include a well screened at 120 to 140 feet below the surface.

- Mill Creek and East drain water and sediments upstream and downstream of the Western Processing site.

- Air monitoring for organics and particulates during construction.

Most alternatives in the Feasibility Study had groundwater monitoring. The no action alternative is not adequately protective of public health and the environment, and would not comply with the RCRA groundwater protection strategy.

Monitoring costs are estimated to be $540,000 per year.

Community Relations

A major comment during the public comment period on the Feasibility Study was the interested community's desire to have access to monitoring data and other information on the status of the site before significant decisions are made. EPA intends to remain the lead agency for community relations, with active participation by WDOE and the contractors.

Activities will include:

- Public presentations on the progress of work on the Western Processing site, with the frequency and location to be guided by public interest and the City of Kent. A suggested approach is for monthly presentations at the City of Kent City Council Workshops throughout the design and active remedial construction period, with quarterly or annual presentations during the extended O&M and monitoring periods.

- Preparation and distribution of a public notice and fact sheet at the completion of engineering design

- Continuation of the information repository at the City of Kent and EPA Regional library. At a minimum, copies of all public and press releases; QAed groundwater, surface water, soil, sediment, and air monitoring data; supplemental remedial planning documents and all other similar documents will be placed in these repositories promptly.

- Public presentations on the supplemental planning studies, if any are initiated. Public presentations would, at a minimum, be made during the design or scoping of the study, and again when the study is completed and recommendations are made. These public presentations may be part of the above regular public presentations, with additional public announcements on the agenda of the presentation.

Other Issues

Any construction in the flood hazard areas in Mill Creek will be designed to not adversely change flood elevations and to comply as much as practicable with all applicable local rules, regulations, and ordinances.

Costs

The estimated costs (+50% to -30%) for the recommended alternative is:

Detailed design	$3,415,000.
(Of which, $1,625,000 is for soil and waste sampling and analysis.)	
Capitol Costs	
On-site soils	$5,200,000.
Off-site soils	625,000.
Groundwater pump and treat	6,800,000.
Enhanced leaching	2,600,000.
Mill Creek excavation	1,300,000.
Total	18,100,000
Operation and Maintenance	
Annually, during initial phase of system operation	
Without ennanced leaching	2,000,000.
With enhanced leaching	3,000,000.

The present worth of the proposed alternative for the five years of initial system operation is estimated to be $26,300,000, not including detailed design and soil sampling and analysis.

Most of these costs are based on the data in the Feasbility Study. The costs for the enhanced leaching and soil sampling programs were developed after the Feasility Study was completed.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

The following federal environmental standards are applicable to remedial actions at the Western Processing site:

- Hazardous Waste Regulations (RCRA), Subpart G - closure and post-closure
- Hazardous Waste Regulations (RCRA), Subpart F - Groundwater protection requirements, including potential ACLs for the most toxic and persistent chemicals
- Hazardous Waste Regulations (RCRA) relating to compliance at off-site disposal facilities
- Clean Water Act pretreatment standards for discharge into a publicly owned treatment works
- TSCA requirements for PCB disposal
- Guidelines for Specification of Disposal sites for Dredged or Fill Material
- National Ambient Air Quality Standards
- Floodplains Executive Order
- OSHA Requirements
- DOT Hazardous Materials Transport Regulations

The following federal environmental standards are relevant to remedial actions at the Western Processing site:

- Water Quality standards for Mill Creek, as determined by the State of Washington under the Clean Water Act, if there is a surface water discharge

The following federal environmental criteria, guidance, and advisories are to be considered in remedial actions at the Western Processing site:

- RMCL

- Federal Water Quality Criteria

- EPA's Groundwater Protection Strategy

- Floodplain Executive Order

The following state environmental criteria, guidance, and advisories are to be considered in remedial actions at the Western Processing site:

- State groundwater approval

- State How Clean is Clean policy

The RCRA Subpart G - Closure and Post-closure - technical requirements were applied in a number of different ways. Example Alternative 2 was designed to comply with the standards for closure as an existing land disposal unit. Example Alternative 3 was designed to comply with the standards for closure as a new land disposal unit. Example Alternative 5 was designed to comply with the standards for closure for a storage facility. The RCRA Subpart F - Groundwater Protection technical requirements were satisfied in Example Alternatives 2, 3, and 5.

The recommended alternative is an interim measure. However, the relevent and applicable standards, criteria, guidance, and advisories have been considered in the recommended alternative whenever practicable.

Aspects of the recommended alternative which are compliant with the applicable and relevant portions of RCRA regulations include:

- Groundwater monitoring

- PCB clean-up levels (The 2 ppm off-site level in also consistent with WDOE policy.)

- Off-site soil cover design and maintenance

- Title/deed restrictions if certain off-site areas are capped instead of excavated.

Aspects of the recommended alternative which are consistent with the Assistant Administrator's application of RCRA to the Crystal Chemical CERCLA site include:

- Consolidation on-site of hazardous substances which have migrated off-site from Western Processing

- When combined with the recommended alternative's groundwater actions, the off-site excavation criteria

- In situ stabilization and treatment

Aspects of the recommended alternative for which RCRA compliance will be determined in the next phase of remedial action include:

- Acceptable shallow groundwater concentration limits.

- On-site cap design.

- Title/deed restrictions in Area I.

The federal Water Quality Criteria for aquatic organisms are used to set the Mill Creek water quality needs in all Example Alternatives and the recommended alternative. As described below in the recommended alternative section, the recommended alternative is consistent with EPA's Groundwater Protection Strategy. The shallow groundwater is technically Class II, though it has some elements of the Class III definition. Alternative water supplies are available.

Other key requirements which will be complied with include: RCRA requirements at off-site disposal facilities; Clean Water Act pretreatment standards for discharge into a publicly owned treatment works; TSCA requirements for PCB disposal; guidelines for the disposal of dredged material; air quality standards; floodplain protection requirements; DOE Hazardous Materials Transport Regulations; and the State of Washington Water Quality Standards for Mill Creek.

The State of Washington Department of Ecology participated in the development of the Feasibility Study and has concurred in the recommended alternative.

OPERATION AND MAINTENANCE (O&M)

The O&M activities required to ensure effectiveness of the remedy include:

Operation of the groundwater extraction and treatment system as long as necessary

Maintenance of the RCRA on-site cap and off-site caps/covers, and stormwater control system for a minimum of 30 years

Long-term monitoring of the shallow and deep groundwater, and Mill Creek water and sediment quality.

These O&M activities may be required in perpetuity if these or other remedial actions do not mitigate the releases or if problems are detected. Alternatively, certain of these activities may be allowed to cease after EPA has determined that no threats to public health, welfare, or the environment would occur.

Annual O&M costs with the operation of the groundwater extraction and treatment system are estimated to be $2,000,000 to $3,000,000 depending on whether the enhanced leaching system is operating. Annual O&M costs would be lower when the groundwater extraction system ceases operation.

Because this is an interim remedy and the initial phase of system operation/construction will require up to five years, monitoring and the operations and maintenance of the pumping system for five years is part of the remedial action which will be paid for by both the Fund and WDOE. An EPA/State contract or cooperative agreeement will be the mechanism for this O&M. WDOE acknowledges that O&M in future years will be the responsibility of the state.

SCHEDULE

- Complete Enforcement Negotiations	September, 1985
- Approve Remedial Action (sign ROD)	September, 1985
- Award IAG for Remedial Design to COE	October, 1985
- Start Design	November, 1985
- Award Superfund State Contract for Construction	April 1986
- Advertise for Construction Bids	April 1986
- Start Construction	June 1986
- Complete Major On-site Excavation	August 1986
- Start Groundwater Extraction	1987

Fund-financed and state financed actions will be neccessary for stormwater control actions until construction starts in 1986.

FUTURE ACTIONS

The additional remedial activities which are required to complete the site response may include:

Supplemental remedial planning and possibly a third operable unit if the extent of groundwater contamination is not adequately control by the shallow groundwater extraction and treatment system, if the contamination in the shallow groundwater is not adequately reduced by the shallow groundwater extraction and treatment system and in situ chemical leaching, or if contamination from Western Processing is found in the regional aquifer.

Site close-out with a cap.

Long-term O&M on the groundwater extraction and treatment system, cap, cover and stormwater control systems, and monitoring systems.

Table [redacted]1

INDICATOR CONTAMINANTS USED AT WESTERN PROCESSING

Organics	Inorganics
Volatile Organics:	Metals:
1,1,1-Trichloroethane	Cadmium
Trans-1,2-Dichloroethene	Chromium
Tetrachloroethene	Copper
Trichloroethene	Nickel
Toluene	Lead
Chloroform	Zinc
Acid Extractable Compounds:	
2,4-Dimethylphenol	
Phenol	
Base/Neutral Compounds:	
Total PAH's[a]	
Total Phthalates	
Other Organics:	
PCB's	
Oxazolidone	

[a] Total priority pollutant polycyclic aromatic hydrocarbons (PAH's).

Table [redacted]2

LOCATION OF CHEMICALS WITHIN THE SOIL PROFILE

Indicator Compounds	Depth Below the Surface Where Compounds Were Most Frequently Found	Depth Below the Surface Where Compounds Were Found in the Highest Concentrations
Metals	0 to 9 feet	0 to 9 feet
Volatile Organics	6 to 9 feet	6 to 9 feet
Acid Extractables	9 to 21 feet	9 to 21 feet
Base/Neutrals		
Total PAHs	0 to 3 feet	0 to 3 feet
Phthalates	0 to 9 feet	Surface soil
PCB's	Surface soil	10 feet (on-property) Surface soil (off-property)

[redacted]

EB00039

Table [redacted] 3

TOTAL MASSES AND SITE AVERAGE CONTAMINANT CONCENTRATIONS (NONDETECTS = 0) WESTERN PROCESSING, KENT, WASHINGTON

Area	Contaminant	Total Mass in Soil 0-6 ft. (Kg)	Total Mass in Soil 6-15 ft. (Kg)	Total Mass in Soil 15-30 ft. (Kg)	Average Soil Concentration 6-15 ft. (µg/Kg)	Average Soil Concentration 15-30 ft. (µg/Kg)	Average Groundwater Concentration 6-15 ft. (µg/L)	Average Groundwater Concentration 15-30 ft. (µg/L)
I/II	Volatiles							
	Phenol	293	724	190	2,929	460	108,583	1,490
	Methylene chloride	337	358	61	1,446	148	56,872	48,971
	Trans 1,2-dichloroethene	0.01	1	1	2	1	20,297	154
	Chloroform	28	99	1	403	2	2,378	2,012
	Trichloroethene	2,245	5,220	17	21,105	43	29,508	7,244
	1,1,1-Trichloroethane	376	883	1	2,275	1	21,609	1,014
	Toluene	1,016	2,122	22	8,582	52	1,633	314
	Tetrachloroethene	148	271	0.3	1,097	1	109	0
	Ethylbenzene	82	203	1	819	3	2	0
	BN/AE							
	Naphthalene	8,207	369	4	1,493	11	2	23
	Phenanthrene	22,391	549	0	2,221	0	0	0
	PCB	58	279	0	1,128	0	0	0
	Pyrene	17,003	83	0	334	0	0	0
	Fluoranthene	993	135	0	544	0	0	0
	Benzo(a)anthrancene	1,086	4	0	17	0	0.3	0
	Bis(2-ethylhexyl) phthalate	3,988	3,207	147	12,968	356	0	0
	Metals							
	Nickel	19,360	20,164	5,103	81,533	12,380	15,129	14,250
	Cadmium	4,738	7,778	605	31,451	1,468	2,391	964
	Zinc	777,160	494,287	93,713	1,872,331	227,355	126,447	117,687
	Chromium	76,329	164,679	16,681	665,879	40,469	5,249	313
	Arsenic	1,312	855	1,753	3,458	4,253	14	12
	Copper	51,022	84,395	10,678	341,250	25,905	1,333	757
	Lead	1,358,394	636,033	5,285	2,564,661	12,823	340	263

Table [redacted]3(cont.)

Area	Contaminant	Total Mass in Soil 0-6 ft. (Kg)	Total Mass in Soil 6-15 ft. (Kg)	Total Mass in Soil 15-30 ft. (Kg)	Average Soil Concentration 6-15 ft. (µg/Kg)	Average Soil Concentration 15-30 ft. (µg/Kg)	Average Groundwater Concentration 6-15 ft. (µg/L)	Average Groundwater Concentration 15-30 ft. (µg/L)
V	**Volatiles**							
	Phenol	29	75	0	1,240	0	745,954	39
	Methylene chloride	1	4	163	60	1,623	40,603	122
	Trans 1,2-dichloroethene	0	0.01	1	0.2	3	147,005	0
	Chloroform	0	0	0	0	0	1,213	3,787
	Trichloroethylene	0.1	1	1	23	6	89,535	8,310
	1,1,1-Trichloroethane	0	0	0	0	0	3,620	0
	Toluene	1	1	4	20	37	1	44
	Tetrachlorothylene	0.02	1	0.1	15	1	183	0
	Ethylbenzene	0	0	0	0	0	0	0
	BN/AE							
	Naphthalene	0	0	0	0	0	0	23
	Phenanthrene	0.1	0	0	0.06	0	0	0
	PCB	5	0	0	3	0	0	0
	Pyrene	0.1	0	0	0.06	0	0	0
	Fluoranthene	0.1	0	0	0.06	0	0	0
	Benzo(a)anthracene	0	0	0	0	0	0	0
	Bis(2-ethylhexyl) phthalate	0.01	0.04	0	1	0	0	0
	Metals							
	Nickel	654	654	951	10,840	9,456	1,327	461
	Cadmium	171	46	16	753	162	68	119
	Zinc	30,643	7,747	3,221	128,439	32,042	10,284	30,876
	Chromium	1,679	924	899	15,318	8,946	66	80
	Arsenic	306	324	813	5,381	8,807	5	15
	Copper	1,235	1,172	2,070	19,440	20,590	42	24
	Lead	7,057	796	233	13,199	2,324	29	21

Table [redacted]3(cont.)

Area	Contaminant	Total Mass in Soil 0-6 ft. (Kg)	Total Mass in Soil 6-15 ft. (Kg)	Total Mass in Soil 15-30 ft. (Kg)	Average Soil Concentration 6-15 ft. (µg/Kg)	Average Soil Concentration 15-30 ft. (µg/Kg)	Average Groundwater Concentration 6-15 ft. (µg/L)	Average Groundwater Concentration 15-30 ft. (µg/L)
IX	**Volatiles**							
	Phenol	0	0	0	0	0	0	0
	Methylene chloride	4	3	4	67	68	20	5
	Trans 1,2-dichloroethylene	0	0	0	0	0	118	18
	Chloroform	0	0	0	0	0	0.3	0
	Trichloroethylene	0.01	0.1	0.01	2	0.1	106	46
	1,1,1-Trichloroethane	0	0	0	0	0	10	7
	Toluene	0.03	0.1	1	3	18	0.1	0
	Tetrachlorothylene	0	0	0	0	0	0	0
	Ethylbenzene	0.01	0.01	0	0.1	0	0	0
	BN/AE							
	Naphthalene	0.2	0	0	0	0	0	0
	Phenanthrene	0.02	0	0	0	0	0	0
	PCB	37	0	0	0	0	0	0
	Pyrene	0.2	0	0	0	0	0	0
	Fluoranthene	0.1	0	0	0	0	0	0
	Benzo(a)anthracene	0.3	0	0	0	0	0	0
	Bis(2-ethylhexyl) phthalate	1	1	443	10,719	6,557	0	0
	Metals							
	Nickel	594	547	728	13,509	10,770	540	0
	Cadmium	135	81	25	1,992	367	94	0
	Zinc	15,478	14,221	4,319 ?	330,817 ?	63,915	36,751	[illegible]
	Chromium	9,470	3,767	817	92,928	12,092	7	0
	Arsenic	333	435	443	10,719	6,557	0	0
	Copper	2,320	1,738	1,429	42,872	21,161	3	0
	Lead	1,698	479	142	11,809	2,098	0	0

EB0041

Table 4

SUMMARY OF PUBLIC HEALTH, ENVIRONMENTAL, AND TECHNICAL EVALUATIONS

	Example Alternative	Cost (Millions) Capital	Cost (Millions) Present Worth	Public Health Aspects	Environmental Aspects	Technical Aspects	Other
1.	No Action	-0-	-0-	On-property contamination (soils up to 12 feet deep) would continue to have potential maximum lifetime excess cancer risk (worker scenario) of 5×10^{-4}. Groundwater contamination from Western Processing would pose no threat to City of Kent or any other public water supply wellfields. The concentrations of organic and inorganic (metal) contaminants in the groundwater immediately below Western Processing exceed drinking water standards and Acceptable Daily Intake (ADI) levels. Ingestion of this groundwater over a 40-year period could lead to a maximum lifetime excess cancer risk (worker scenario) of 3×10^{-1}. However, the shallow aquifer is not used for water supply. Recreational use of Mill Creek would not pose a threat to human health.	Priority pollutant metal concentrations in Mill Creek downstream of Western Processing exceed chronic and acute ambient water quality criteria for aquatic organisms. These metal concentrations probably are and would continue to be toxic to a wide variety of aquatic organisms for hundreds of years. Priority pollutant organic concentrations in Mill Creek downstream of Western Processing do not exceed ambient water quality criteria for aquatic organisms. Sediments in Mill Creek contain high levels of priority pollutant metals.	Stormwater runoff would be in contact with contaminated soils and could carry contamination from the site onto adjacent areas and into Mill Creek. Infiltration would continue to leach contaminants from the unsaturated zone and carry them into the groundwater beneath the site. Contaminated groundwater from Western Processing would continue to discharge into Mill Creek at 30 to 70 gpm. Groundwater quality beneath the site would improve only very slowly (i.e., would require well beyond hundreds of years to achieve levels that would not adversely impact Mill Creek water quality).	Since 1983, three major response/remedial actions at Western Processing have stopped the discharge of contaminated runoff from the property to Mill Creek and removed waste materials and all structures from the surface of the property. These actions have eliminated potential hazards such as fires, explosions, and spills or leaks of waste materials. Future use of the site may be restricted by local authorities.
2.	Multimedia cap over Areas I and II, and a portion of Area V (provides two layers to prevent infiltration). Controlled stormwater discharge from capped areas into Mill Creek Groundwater pumping from Areas I, II, V and IX, onsite treatment and	\$12.2 Average annual operation & maintenance cost/ \$1.87	\$30.2	Would eliminate direct human and animal contact with contaminated surface soils in capped areas; however, all soils would remain in place. Drinking water standards and ADI's for organics in the groundwater under the site would be met in less than 15 years of pumping; SNARL's* for longer term use would not be met until after approxi-	Once pumping begins, Mill Creek waters would approach ambient water quality criteria or background (whichever is higher) for dissolved metal contaminants. Contaminants adhering to Mill Creek sediments and gradually leaching back into Mill Creek waters may delay achieving ambient water quality criteria or background. Would eliminate contaminated	The pumping system would eliminate discharge of contaminated groundwater to Mill Creek from Areas I, II, V, and IX during the pumping period. An extremely long pumping, treatment, and systems maintenance period would be required before water quality criteria, standards, or background levels could be met in	Would comply with RCRA technical requirements for closure as an existing land disposal facility. The groundwater extraction rate would be limited primarily by sewer system capacity and secondarily by the permeability of the soils.

NOTE: See Figure 1 for locations of Areas I through X.

*Suggested No Adverse Response Level(s).

EB0043

Table 4 (continued)

Example Alternative	Cost (Millions) Capital	Present Worth	Public Health Aspects	Environmental Aspects	Technical Aspects	Other
2. Continued discharge into Metro system (100 gpm) Monitoring Health and safety plans and training prior to construction			mately 40 years of pumping. Achieving federal drinking water standards in the groundwater for metal contaminants would be much more difficult. For example, it would require well beyond 100 years of pumping to achieve the cadmium standard, while the standard for lead may never be achieved.	stormwater discharges from capped area. Approximately 60 to 120 years of groundwater pumping would be required to reduce the concentrations of metals in the groundwater to levels that would not cause continued degradation of Mill Creek after the pumping system is turned off. Water quality problems in Mill Creek upstream of Western Processing, such as low dissolved oxygen levels, could continue to limit the habitat quality in Mill Creek.	Mill Creek after the pumping system is turned off. Cap would prevent infiltration and leaching of contaminants from the unsaturated zone in Areas I, II, and V into the groundwater. Effective cap lifetime in this application is not known. Would require permanent access to some adjacent properties. Would require a 12-month construction period. Cap would require relatively complex construction techniques. Construction impacts could be mitigated by good construction practices, dust and runoff controls, and scheduling.	Future use of the capped areas would be prohibited.
3. Excavate all unsaturated soils (108,000 cubic yards) in Areas I and II and one foot in a portion of Area VIII, with disposal in new 11-acre, double-lined, RCRA on-site landfill. Multimedia cap over landfill (Area I), Area II, and a portion of Area V (see Example Alternative 2). Controlled stormwater discharged from capped areas into Mill Creek	$18.3 Average annual O&M cost: $1.69	$31.9	Would eliminate direct human and animal contact with contaminated soils in capped areas and in Area VIII. Ability to achieve drinking water standards, ADI's, and SNARL's for organic and inorganic (metal) contaminants in groundwater beneath the site would be essentially identical to Example Alternative 2.	Would be identical to Example Alternative 2.	Would eliminate discharge of contaminated groundwater from Western Processing to Mill Creek while the pumping system is operating. Like Example Alternative 2, an extremely long post-construction pumping, treatment, and site maintenance period would be required before water quality standards, criteria, or background levels could be met in Mill Creek after the pumping system is turned off. Would require the same type of access as in Example Alternative 2.	Would comply with RCRA technical standards for construction and closure of a new hazardous waste landfill. Materials to be excavated have not yet been classified under the WDOE Dangerous Waste Regulations. No "Extremely Hazardous Waste" may be landfilled within Washington State. Certain excavated materials such as PCBs, buried drums, and concentrated wastes would require special handing and possibly disposal procedures. Future use of the landfill and capped areas would be prohibited.

Table 4
(continued)

Example Alternative	Cost (Millions) Capital	Cost (Millions) Present Worth	Public Health Aspects	Environmental Aspects	Technical Aspects	Other
3. Continued Groundwater pumping around landfill and in portions of Areas II and V, onsite treatment, and discharge into Metro system (85 gpm) Monitoring Health and safety plans and training prior to construction.					Landfill liners and leachate collection system, when combined with the cap, would provide more protection from contaminant leaching from unsaturated zone into the groundwater than Example Alternative 2. Effective landfill and cap lifetime in this application is not known. The landfill would be constructed in phases, with the excavated material stored onsite. This would be very difficult, but not impossible, to accomplish on the limited (11-acre) space on Area I. Would require 48-month construction period. Cap and landfill would require relatively complex construction techniques. The landfill and cap combination would isolate approximately 60 percent of both the zinc and total contamination in the soil. Construction impacts could be mitigated by good construction practices, dust and run-off controls, and scheduling.	
4. The PRP Proposal* Excavate to variable depths (1' to 8') in Area I	$45.6 Average annual O&M cost: $1.9	$48.9	Would eliminate direct human and animal contact with all surface soils in Area I. ADI's, drinking water standards, and SNARL's for all except one indicator organic	Both during and after up to 5 years of pumping, Mill Creek water quality should be able to meet ambient water quality or background levels for all Western Processing-related contaminants. Water quality	Once the diversion barrier is installed, the discharge of contaminated groundwater to Mill Creek from Area I would be reduced by approximately 50 percent.	Does not address off-property contamination other than off-property contaminated groundwater (which could potentially be removed during the pumping program). Off-property remedial actions such as those

*Summary prepared by PRPs.

EB0044

EB0045

Table 4
(continued)

	Example Alternative	Cost (Millions) Capital	Cost (Millions) Present Worth	Public Health Aspects	Environmental Aspects	Technical Feasibility	Other
4.	Continued Offsite disposal of all excavated material (75,000 cubic yards) in a double-lined RCRA landfill Replace excavated material with imported fill Diversion wall, 40 feet deep, inside the perimeter of Area I Groundwater pumping and stormwater infiltration in Area I for up to 5 years, onsite or offsite treatment, discharge to Metro or the Green River (100 gpm) Asphalt pavement over Area I upon completion of pumping Monitoring Health and safety plans and training prior to construction			would be met within up to 5 years of pumping. Drinking water standards for metals could not be met even if the pumping program were extended indefinitely.	problems in the creek not related to Western Processing would continue.	Once pumping starts, the discharge of all contaminated groundwater from Area I would be prevented. The potential for discharge of contaminated stormwater runoff from Area I would be eliminated. The infiltration system that would operate during the pumping program would provide additional contaminant removal from the Area I unsaturated zone. Would require 24-month construction period. Installation of diversion barrier would require relatively complex construction techniques. Construction impacts could be mitigated by good construction practices, dust and runoff controls, and scheduling. Would remove 70 percent of contaminants from the unsaturated zone including 80 percent of the zinc contamination in Area I.	described in the other example alternatives would be one of the subjects of negotiations. The groundwater extraction rate for this alternative is primarily limited by considerations related to reducing total groundwater treatment requirements and secondarily by soil conditions. Double-lined landfill capacity is not currently available in the Northwest but will be available by mid-1985. The disposal costs were estimated to be $100 per ton, but could vary substantially. Property would be suitable for future use.
5.	Excavate 15 feet in Areas I and II, 3 feet in a portion of Area V (including the old discharge line), 3 feet in Area IX, and 1 foot in a portion of Area VIII. Offsite disposal of all excavated material (300,000 cubic yards) in a double-lined RCRA landfill	$180.3 Average annual O&M Cost: $0.1	$164.0	Would eliminate direct human and animal contact with all surface soils contaminated by Western Processing. Would reduce concentrations of organic contaminants in the groundwater beneath Areas I and II to or near drinking water standards, ADI's, and SNARL's for longer term use. Lead levels will be reduced	Excavation would be sufficient to allow the levels of metals in Mill Creek, including zinc, to permanently meet ambient water quality criteria or background, whichever is higher. Would eliminate contaminated stormwater discharge to groundwater and Mill Creek.	Most reliable and proven source control alternative. Approximately 95 percent of all contamination in soil would be removed by excavation. Would permanently eliminate contaminated groundwater discharges to Mill Creek from Areas I and II. The off-property excavations would reduce most average metal concentrations in soils to background.	Complies with RCRA technical requirements for closure as a storage facility. Future property use would not be restricted. Double-lined RCRA landfill capacity is not currently available in the Northwest but will be available by mid-1985. The disposal costs were estimated to be $100 per ton but could vary substantially.

EB0046

Table 4
(continued)

Example Alternative	Cost (Millions) Capital	Present Worth	Public Health Aspects	Environmental Aspects	Technical Aspects	Other
5. Continued Replace excavated material with imported soil Groundwater pumping for excavation, dewatering, onsite treatment, and discharge to the Metro system. Monitoring Health and safety plans and training prior to construction.			sufficiently to meet the drinking water standard; however, cadmium will not.	Water quality problems in Mill Creek not related to Western Processing would continue to limit habitat quality.	20 months of excavation over a 4-year construction period. Dewatering and groundwater treatment would continue during months when excavation is not occurring. 40,000 truck trips would be required to haul contaminated material away from and imported material to the site. Would require no operation or maintenance activities other than monitoring. No permanent access would be required. Construction impacts could be mitigated by good construction practices, dust and run-off controls, transportation plans, and scheduling.	
6. Mill Creek No Action (After implementation of Example Alternative 2, 3, 4, or 5)	-0-	-0-	None. Mill Creek sediments do not pose a threat to human health.	The Mill Creek sediments, which are contaminated particularly with metals as a result of surface and groundwater discharges from Western Processing, would continue to be moved downstream (and eventually dispersed and diluted) by natural processes. Contaminants on sediments could adversely affect aquatic organisms by leaching into the water or by toxic effects on bottom dwelling organisms. Avoids the adverse impacts of diversion and excavation.	With an effective source control action (such as Example Alternative 2, 3, 4, or 5), it would take from 5 to 10 years for the contaminated sediments to be transported out of the local stream reach. The source control would have to remain effective for the sediments to remain uncontaminated.	Modification of Mill Creek above Western Processing as part of Kent's drainage master plan could change the effectiveness of this example alternative, as could the introduction of upstream sources of contaminants.
7. Mill Creek Sediment Removal (after implementation of Example Alternative 2, 3, 4, or 5)	$1.3		None. Mill Creek sediments do not pose a threat to human health.	All contaminated sediment in a 2,300-foot reach of Mill Creek would be removed.	Monitoring of groundwater quality and flow near the creek would be necessary to determine the optimal time to	Modification of Mill Creek above Western Processing as part of Kent's drainage master plan could change the

Table 4
(continued)

EB0047

Example Alternative	Cost (Millions) Capital	Present Worth	Public Health Aspects	Environmental Aspects	Technical Aspects	Other
7. Continued						
Excavate and dispose of sediment from the bed and banks of Mill Creek adjacent to and 1,300 feet downstream of Western Processing. (1,700 cubic yards)				Resuspension and downstream transport of contaminated sediments during construction would be prevented by diverting the creek around the reach to be excavated.	remove the contaminated sediments.	effectiveness of this example alternative, as could the introduction of upstream sources of contaminants.
Divert 2,300 feet of Mill Creek into a pump-and-pipe system during excavation (approximately one month during low flow season)				Excavation and diversion would temporarily destroy 2,300 feet of aquatic habitat.	The source control would have to remain effective for the sediments to remain uncontaminated.	
Rehabilitate stream bed with gravel riffles and natural vegetation				Fish would not be able to pass through this part of Mill Creek during the one-month diversion.	One-month construction period.	
Monitoring				After streambed excavation and rehabilitation, water quality problems upstream of Western Processing, such as low dissolved oxygen levels, could continue to limit habitat quality in Mill Creek.	No operation and maintenance would be required.	

Table 5

WESTERN PROCESSING
DESIGN PHASE SAMPLING PLAN OUTLINE
PRELIMINARY DRAFT
AU 12 85

FIRST ANALYTICAL ROUND
ALL SAMPLES ARE FULL SCANS
BOTH INORGANICS AND ORGANICS

EB0048

ANALYSIS AREA	AREA (acres)	SAMPLE SPACING OR NUM	TOTAL SAMPLE LOCATIONS	SURFACE	3 FEET	6 FEET	DEEPER	TOTALS SAMPLES	DRILLING	NOTES
AREA I	Not Included in Estimate									
AREA II	0.8	50	14	1	1	1	1	56	126	
AREA III	1.7	4	4	1	1	0	0	8	12	
AREA IV	1.5	3	3	1	0	0	0	3		
AREA V	3.4									
OVERLAND FLOW AREA	1.2	30	58	1	1	1	0	174	348	
BALANCE OF AREA	2.2	100	10	1	1	1	0	30	60	
AREA VII	0.9	50	16	1	0	0	0	16		
AREA VIII	0.9	50	16	1	0	0	0	16		
AREA IX	2.6							0		
OVERLAND FLOW AREA	0.8	30	39	1	1	1	1	156	351	
BALANCE OF AREA	1.8	100	8	1	1	0	0	16	24	
AREA X	5.5	50	96							
GW EMERG ZONES	1.0	50	17	1	1	1	0	51	102	
BALANCE OF AREA	4.5	100	20	1	1	0	0	40	60	
					TOTAL SAMPLES			566	1083	

ANALY COSTS	$566,000
DRILLING COSTS	$54,150
LABOR COSTS	$86,640
SUBTOTAL	$706,790
EXPENSES	$70,679
SUBTOTAL	$777,469
CONTINGENCY ([illegible])	$77,747
GRAND TOTAL	$855,216 ✓ 1,000,000

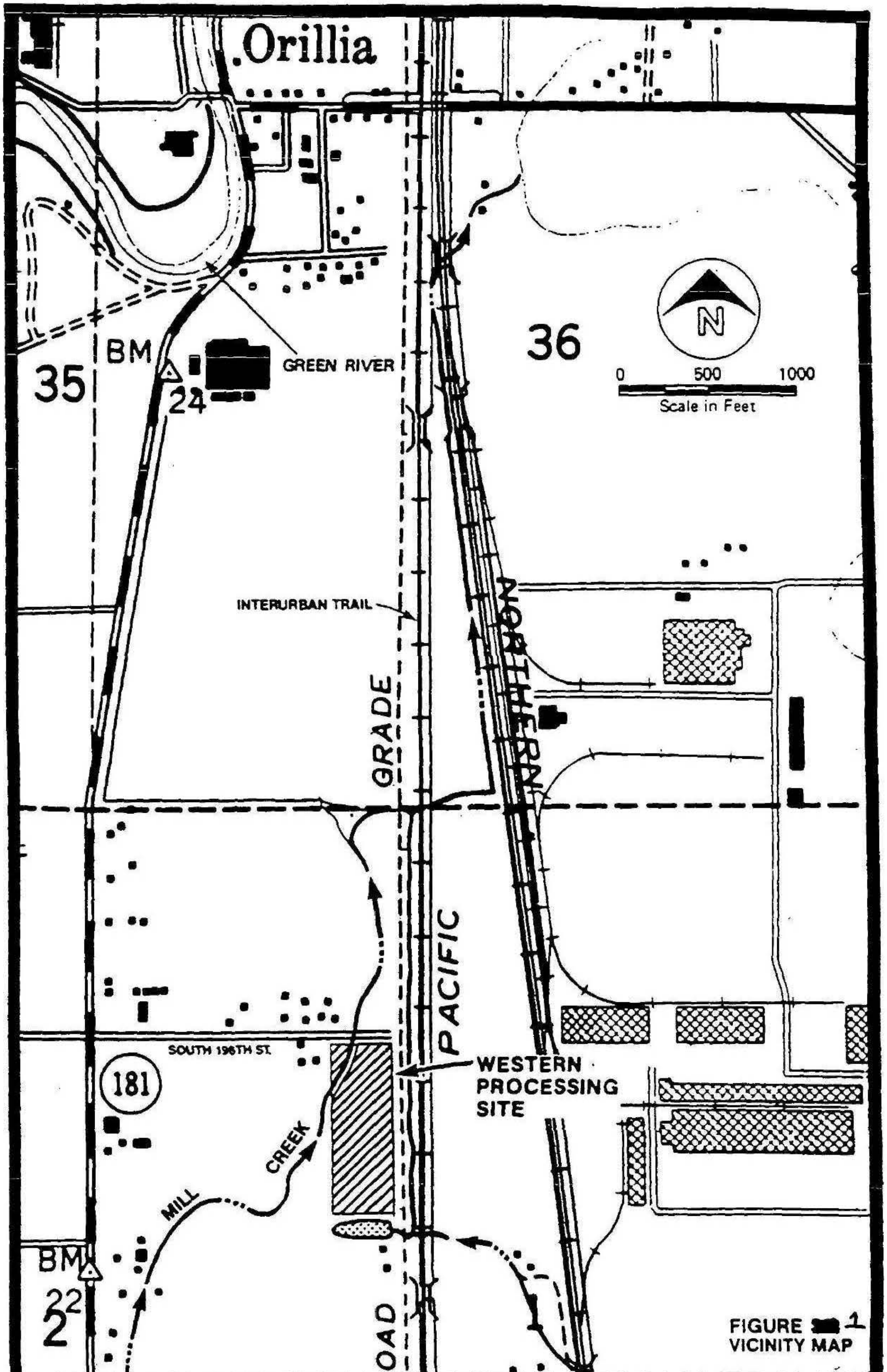


FIGURE 1
VICINITY MAP

EB0049

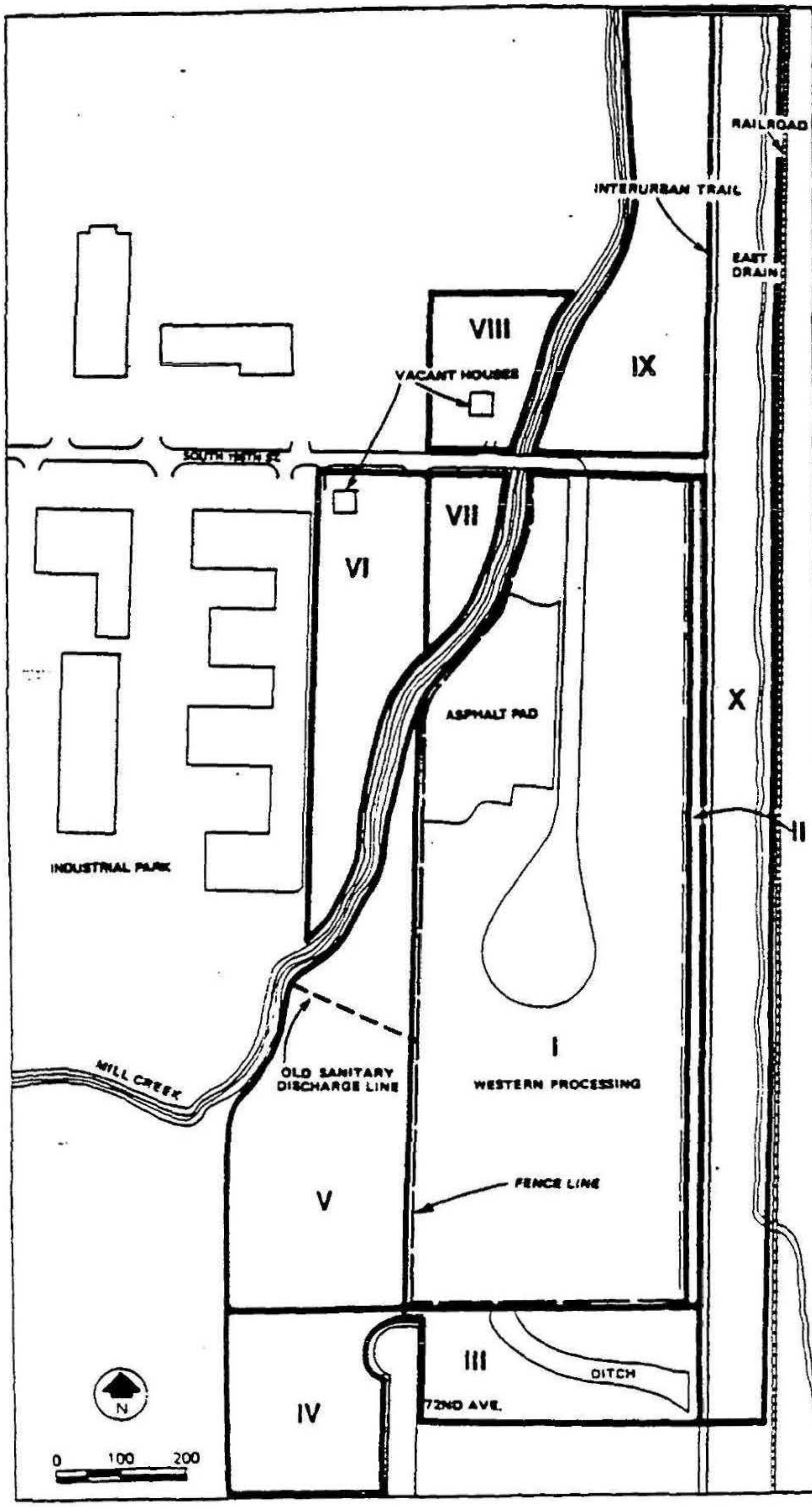
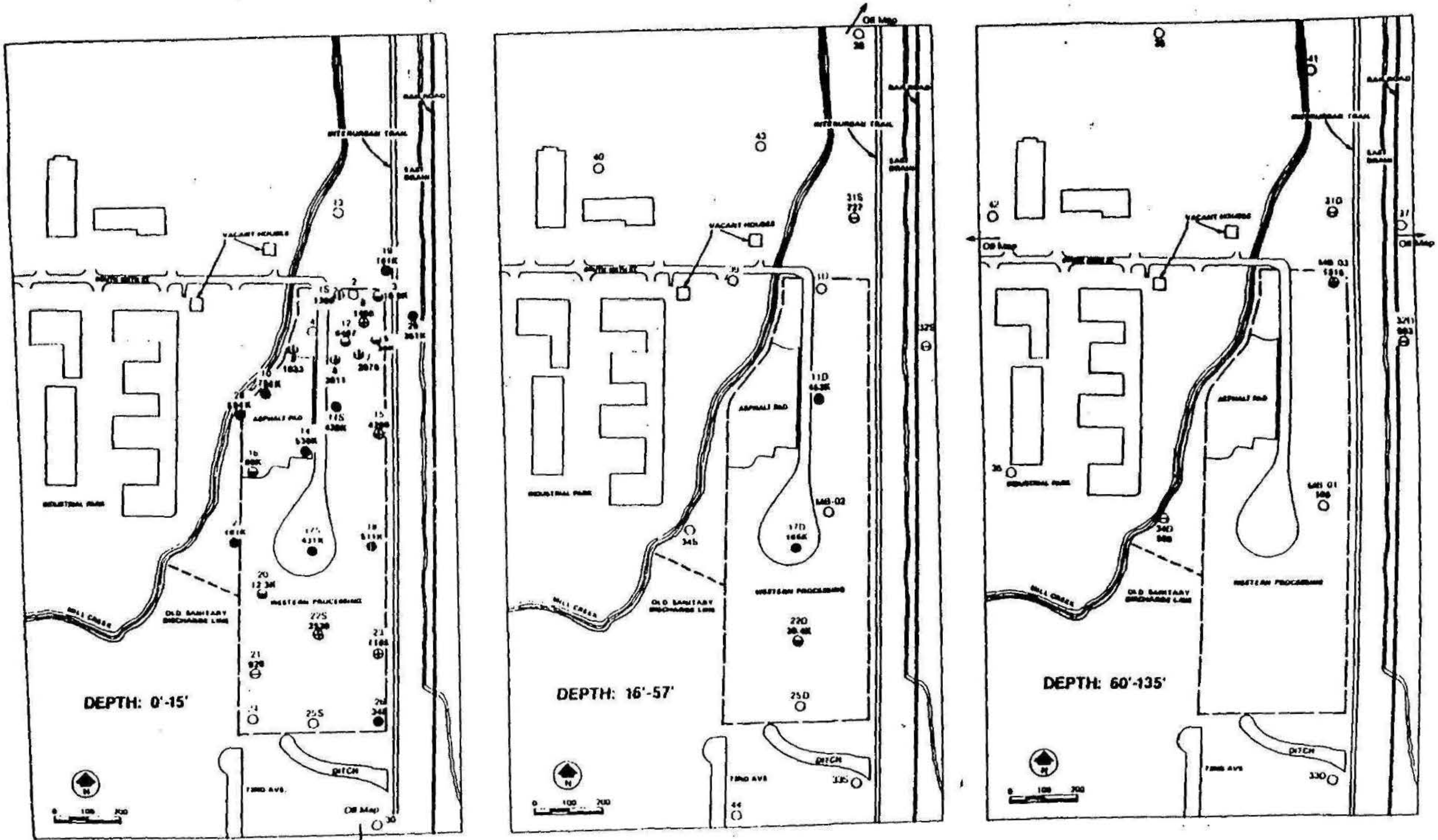


FIGURE 2
ANALYSIS AREAS

EB0050

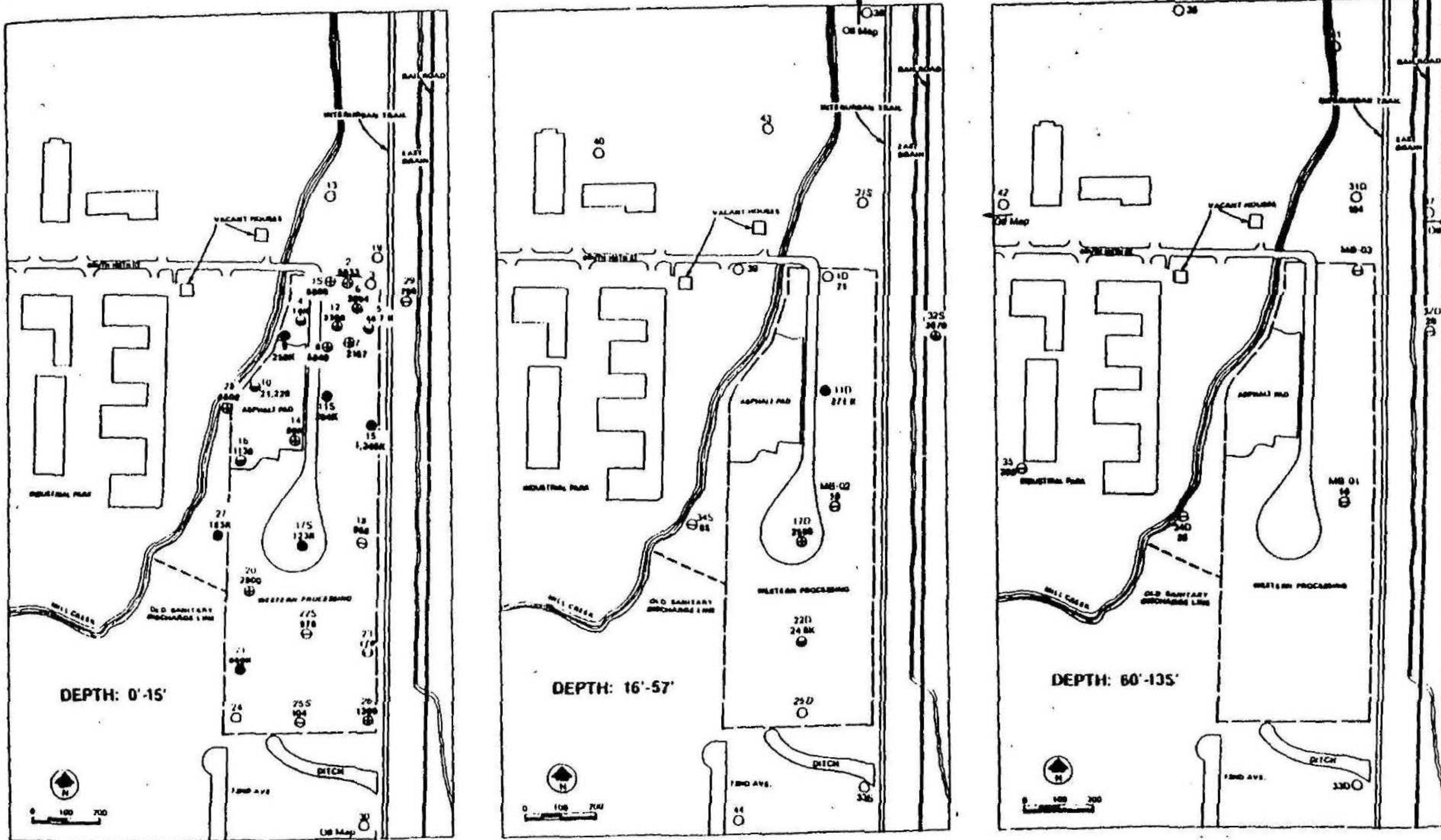


Legend: All concentrations in μg/l
K indicates concentrations x 1000
(ex: 23.7K - 23,700 μg/l)

- 100,000 μg/l
- 10,000-100,000 μg/l
- 1000-10,000 μg/l
- 525-1000 μg/l
- Background

FIGURE 3
INDICATOR PRIORITY POLLUTANT METALS IN GROUNDWATER

EB0051



Legend: All concentrations in µg/L
K indicates concentrations x 1,000
(ex. 23.7K = 23,700 µg/L)

- ● > 100,000 µg/L
- ◒ 10,000-100,000 µg/L
- ⊕ 1,000-10,000 µg/L
- ⊖ 1-1,000 µg/L
- ○ Not Detected
- 27 Well Number

FIGURE [redacted] 4
TOTAL PRIORITY POLLUTANT VOLATILES IN GROUNDWATER

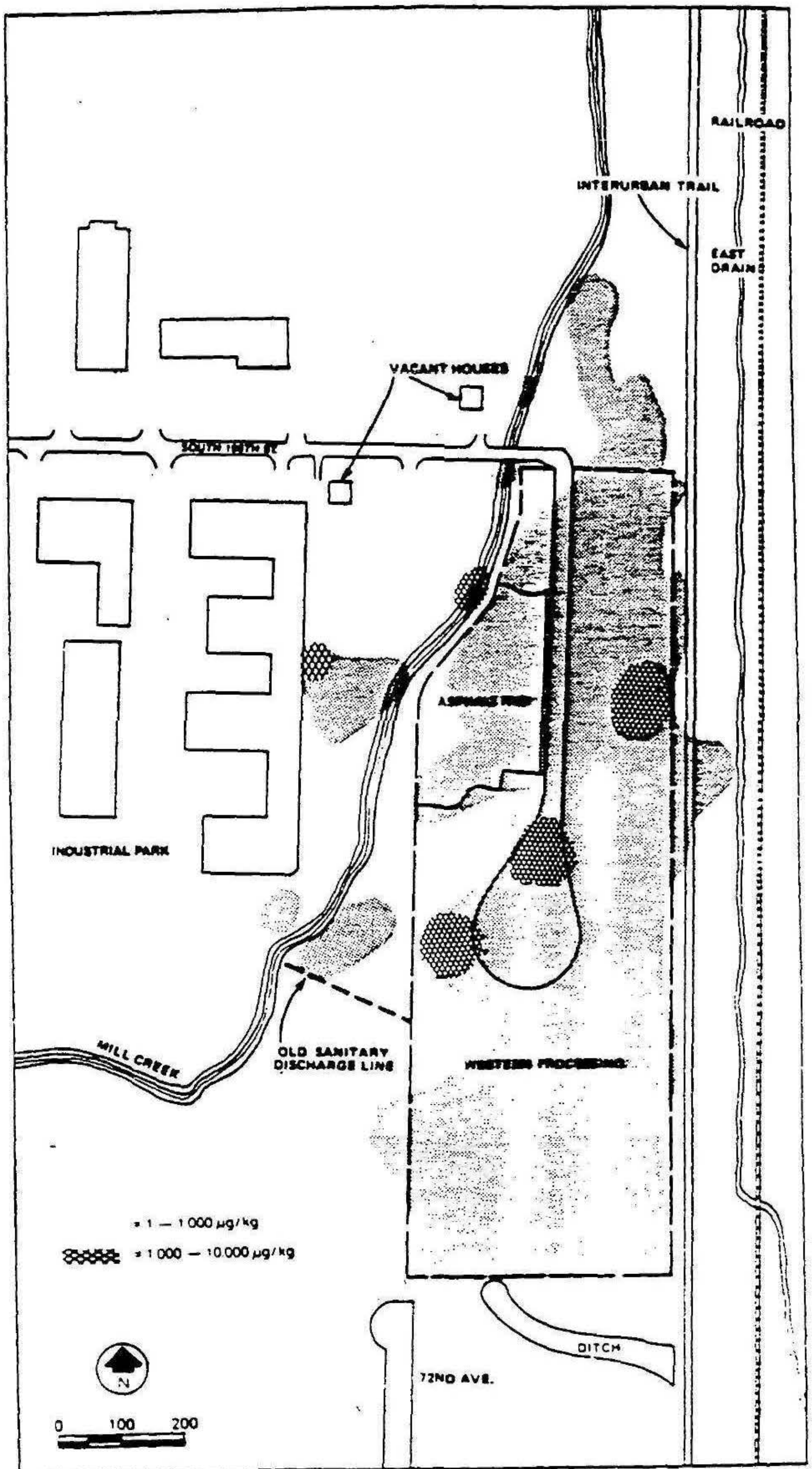


FIGURE 5
SUMMARY OF NATURE AND EXTENT
INDICATOR VOLATILES IN SOILS 0 TO 9 FEET
BELOW GROUND SURFACE

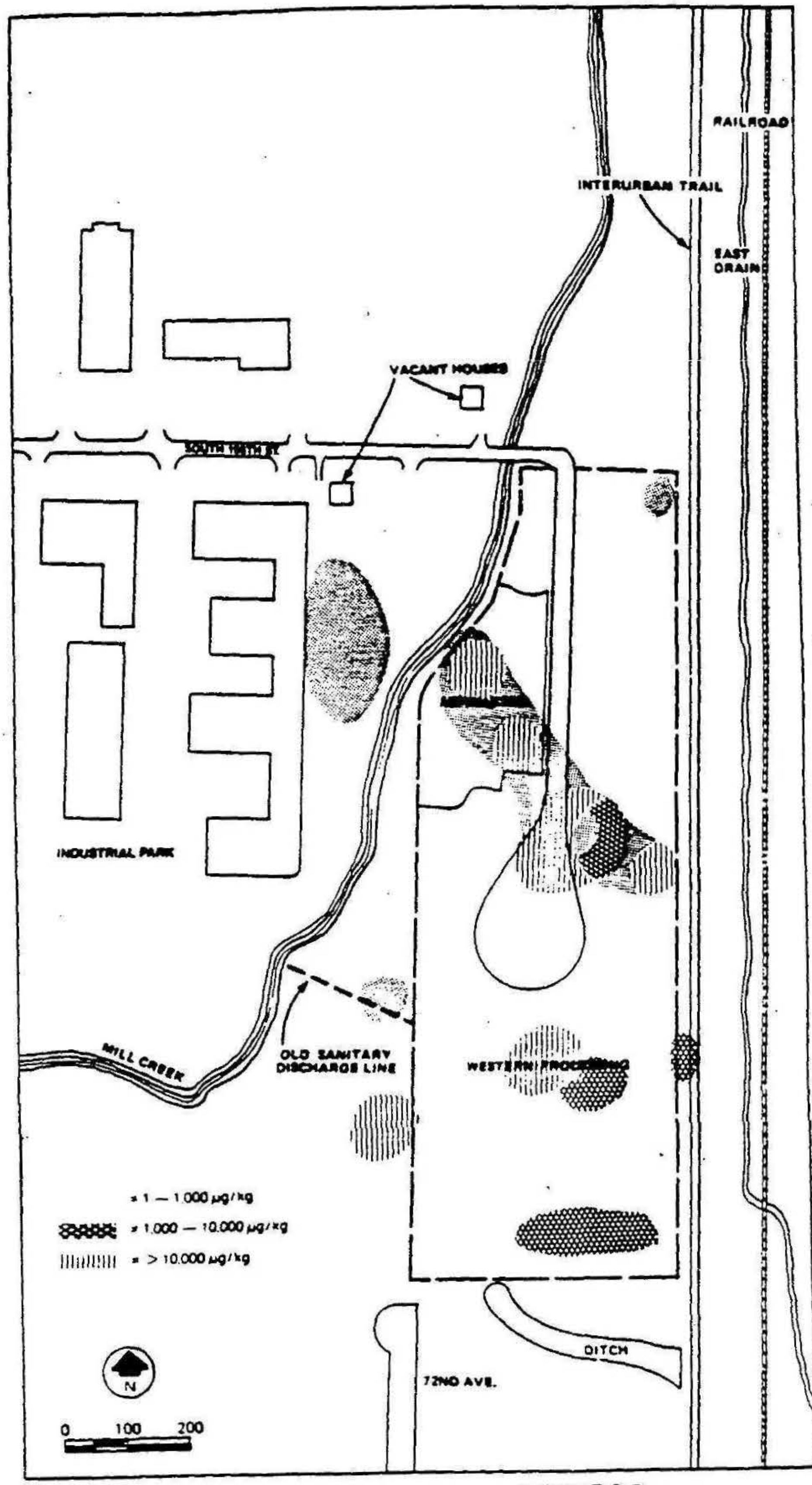


FIGURE 8-6
SUMMARY OF NATURE AND EXTENT
INDICATOR ACID EXTRACTABLES IN SOILS
0 TO 9 FEET BELOW GROUND SURFACE

EB0054

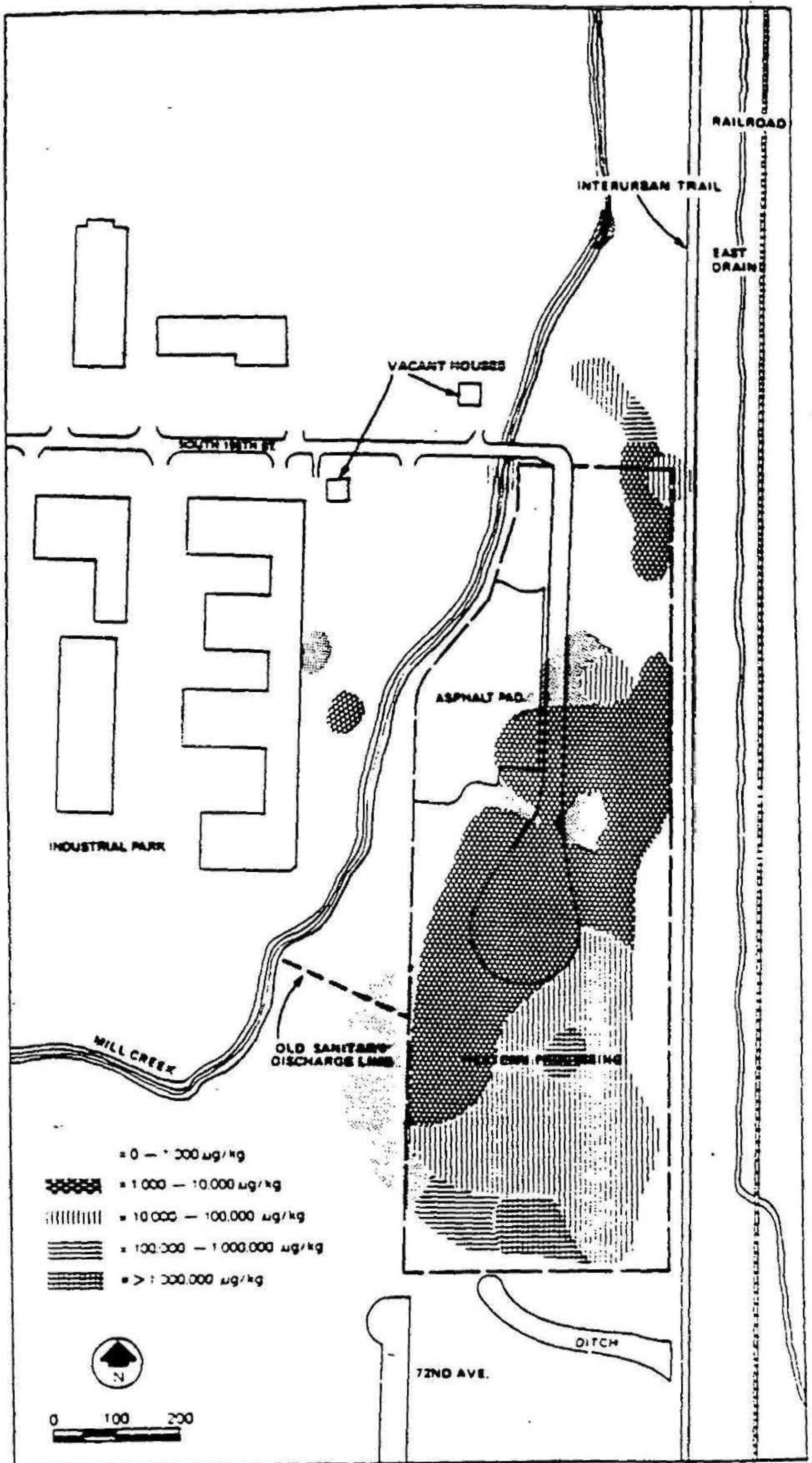


FIGURE [illegible]-7
SUMMARY OF NATURE AND EXTENT
TOTAL PAH COMPOUNDS IN SOILS
0 TO 9 FEET BELOW GROUND SURFACE

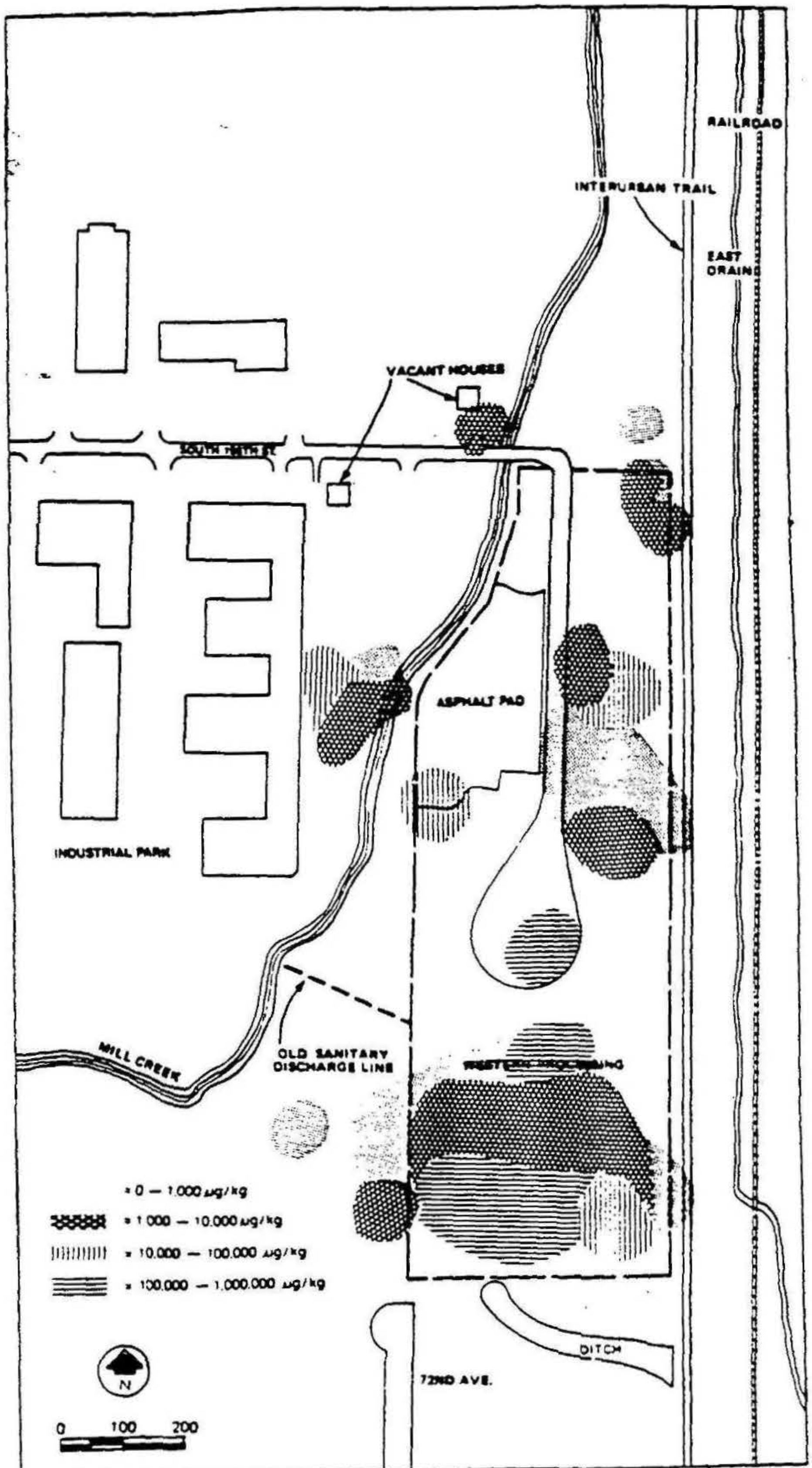


FIGURE 8
SUMMARY OF NATURE AND EXTENT
TOTAL PHTHALATES IN SOILS 0 TO 9 FEET
BELOW GROUND SURFACE

EB0056

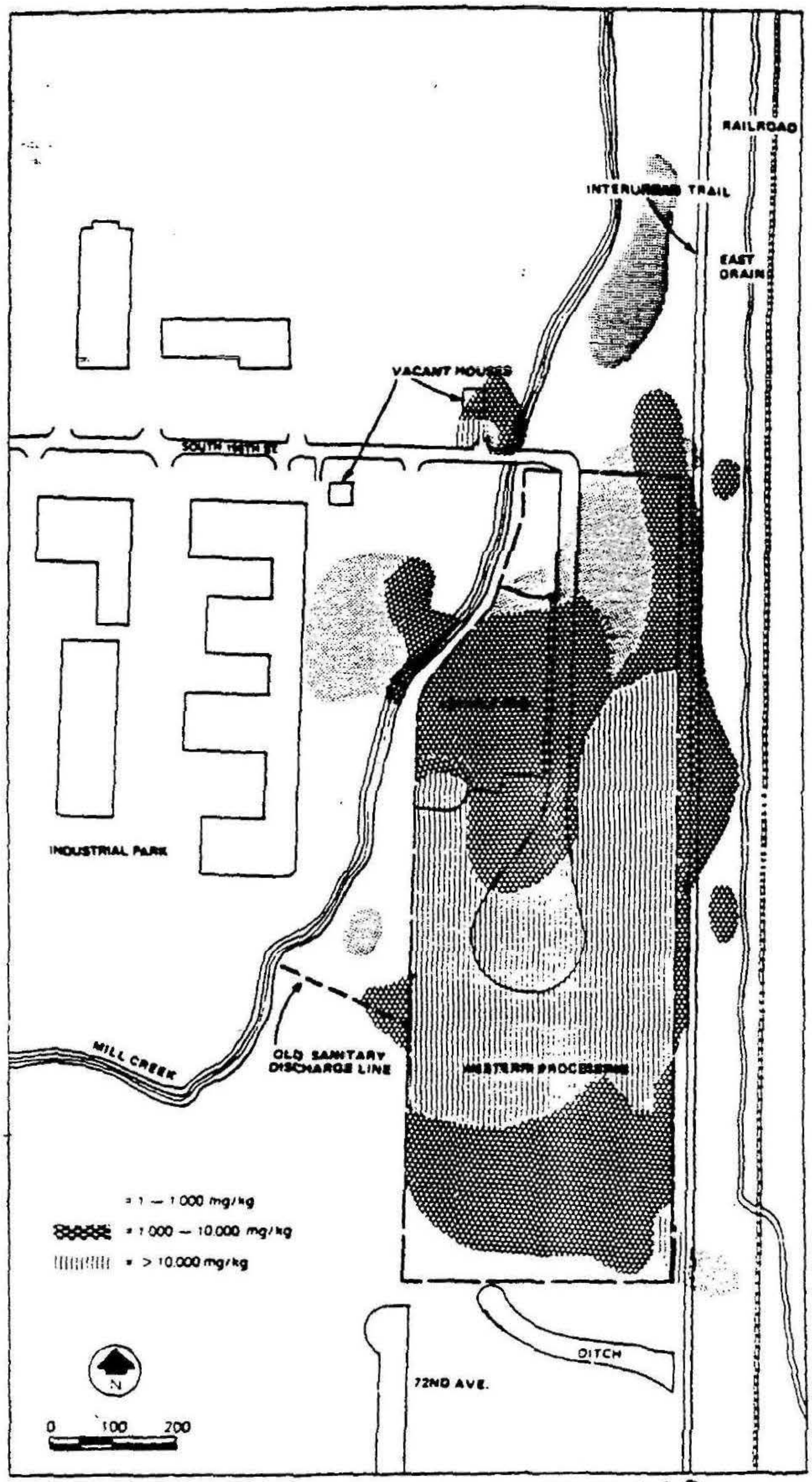


FIGURE 9
SUMMARY OF NATURE AND EXTENT
INDICATOR METALS IN SOILS
0 TO 9 FEET BELOW GROUND SURFACE

EB0057